August 27, 1923

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CHEMICAL & METALLURGICAL ENGINEERING

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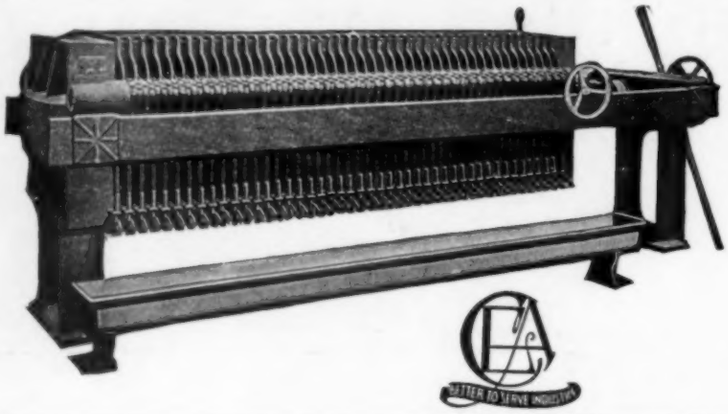

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An Answer
Long Delayed

IN DR. CHARLES A. BROWNE'S collection of papers relating to the history of chemistry and of chemical industry there is a report of a convention of "Friends of Industry" held in New York in the year of grace 1832. An appeal to the government was made by the chemical section of that body for statistical information which would serve as a safe guide to rational business conduct.

The document was brought to the attention of Herbert Hoover, Secretary of Commerce, and he, being an adept in the application of scholarship, immediately focused the appeal in its proper historical perspective.

Now the practical value of true historical perspective is a great asset, although many of our leading educators fail to see it, even to this day. A study of the situation filled out the picture of chemical industry in 1832, and showed it to be well started and full of merit. It made this call for information, the call was not heeded, and the industry soon languished.

Without philosophizing over the exact relation of every cause to the subsequent languishment of the industry the fact stood out that there was something which was needed then and denied, and which study proved to be even more urgently needed now. Therefore instead of denying it again, the splendid corps of men who are at work in the Department of Commerce, in co-operation with others, resolved to meet the situation and to do what they could to answer for today the question which was asked over 90 years ago. And they recognized that the value of statistics drops when they cease to be news. Ever since they began to publish the figures they have had this in mind.

And here is their latest answer in a recent press dispatch:

> Within 48 hours after the close of the month of July there was given to the press by the Department of Commerce, which acted in co-operation with the chemical experts of the Tariff Commission, a complete, itemized statement of imports through the port of New York (representing substantially all of such imports) of all coal-tar intermediates and finished products, such as dyes, medicines, synthetic aromatics, synthetic flavors, tanning materials, etc., and this information as usual embraced the name of each product, the basis of appraisement (whether competitive or non-competitive), tonnage, values where two or more importers were concerned, and the country of origin in terms of percentage.

That kind of information is worth while, and nobody can call it belated. To publish July statistics on Aug. 2 means the cutting out of all kinds of bureaucratic red tape and the hearty working together of two entirely separate branches of government. It could not be achieved without unusual competence on the part of the personnel that contributed this splendid service, and an extraordinary esprit de corps whereby all were inspired with the purpose in view. It could not be accomplished by doing merely enough to insure their pay checks.

We urge upon our readers the recognition and appreciation of this remarkable service. We venture the belief also that the Department of Commerce, from which the information emanates, as well as the chemical section of the Tariff Commission, will be heartened and encouraged if those of our readers who are able to profit by this service will write to Washington and acknowledge it.

The Index Number
And Its Significance

DURING the past 4 months *Chem. & Met.'s* weighted index has told a story of steadily declining prices for chemicals and related materials. Government calculations and various other commodity indexes have recorded similar price movements. This trend, seemingly in variance with general business conditions, has attracted wide public attention and in some quarters it has provoked a challenge as to the usefulness and value of these business indicators. Still other observers who have followed the trend of the index number have seriously overestimated its significance and have entertained some apprehension lest it foretold a more general decline and depression. It can be proved, we believe, that both views are somewhat in error.

In the case of all of the commodity indexes, a study of their detailed changes will generally show that the downward swing of prices is the result of the workings of the old law of supply and demand. We have passed through a period when it is usual for consumption to slacken and prices to recede. It should be remembered, furthermore, that the index number is most valuable as a history of past developments and not as a forecast of the future. To be sure, a study of the long-time trend may be helpful, but it should never be regarded as a basis for absolute prediction. In the case of the *Chem. & Met.* index, for example, there was a rise last week for the first time since the week of June 4, yet on this basis alone it would not be safe to predict that a general change had occurred in the chemical market. Another point to be remembered is that the price index is not a measure of the volume of business activity. During the past few months some of the most important chemicals—e.g., caustic soda, soda ash and bleach—have been moving much more freely than is usual for the summer, but these sales were practically all on contract basis. They find no reflection, therefore, in the index number.

It is when prices are studied in conjunction with other factors that the best appraisal of business conditions is obtained. At the present moment such a view is bound to be optimistic. Money conditions are funda-

mentally sound. The railroads of the country are handling a greater volume of traffic than at any time in their history. Prospects of abundant crops promise to offset the lower prices the farmer will receive for his products. Manufacturing output has continued to be large in spite of any seasonal curtailment, and there can be no doubt that the year 1923 is going to set new production levels for many commodities.

Once in possession of these facts, there is no reason for viewing the price decline with alarm. With the return of active trading this fall the price index number will be forced to reverse its movement.

A Sane Program for Industrial Mobilization

IT HAS well been said that discretion is often the better part of valor. There can be no doubt that it is always discreet for our industries to face the possible demands for the future. Peace-time preparation for industrial mobilization in time of emergency is a subject worthy of thoughtful study, far better today than tomorrow. There is no better time than now to pause and ponder our mistakes of the past war, the better to enable us to chart a saner course should occasion arise in days to come.

Under the terms of our national defence act, the duties of the Assistant Secretary of War include the complete control of policies affecting the business administration of the army. Dwight F. Davis, present incumbent of this office, has recently told us of his proposed plans for bringing about mobilization of our industries in case of necessity. Because our chemical plants are our arsenals in time of need, it seems highly appropriate that we lend both an ear and a hand to the plans of those who have been considering the matter very carefully.

To work out a method for converting the industrial effort of the nation from peace-time production to war-time output without undue delay, overgreat financial losses, dishonest profiteering or consequent economic disruption is the essence of the problem which Mr. Davis has to face. Factors of capital, labor, production facilities, raw material supplies, power and transportation combine to make it many sided and consequently exceedingly difficult. The practical obstacles to be overcome are serious, more especially, of course, in the case of such branches as the Air Service. Wholly dependent upon an infant industry, with uncertainties as to the support of Congress, yet of infinite import in war, such is the situation there! Similarly to a greater or less extent are six other branches of the service, each requiring at least ten different types of supplies which are predominately chemical in nature.

The War Department plan would be based on very much the same scheme for the entire service as has been worked out in considerable detail for the Chemical Warfare branch. Regular army officers will co-operate with Reserve officers and with civilians eminent in various lines of work. In this way it will be possible to develop an industrial staff versed in the demands upon our plants in war as well as in peace time. The example set by the Chemical Warfare Service, which proposes to employ eight advisers in each of four purchasing areas, establishes an excellent precedent. One of these advisers would be a rubber expert, one an expert on charcoal, one on fine chemicals, one on chemical engineering equipment and one on manufacturing methods. These plans, as outlined, are aimed to achieve an end which is of more pressing concern to the country at large and to industry in particular than is commonly appreciated. During the world war the government departments competed with one another for men and materials to such an extent that confusion ran rampant. Some industries found themselves swamped with orders while others were ruined by a sudden cessation of their normal business.

Time saved at the beginning of a future war through adequate industrial mobilization will result in large savings of lives and property. Likewise the economic situation will be upset to a minimum extent. The taxpayer, whether he be employer or employee, may well hope to profit accordingly. Since we, as chemical engineers, are in general peculiarly fitted to be of service in this program, it is to be hoped there will be no lack of support. Let the pacifist be comforted by the thought that the man who can fight and fight well seldom ever has to fight.

Super-Secrecy in Chemical Manufacture

THIS editorial is about secrets. We've listened to lots of them in our day and probably it will be our privilege to hear a good many more. The woods are full of secrets, and so are the chemical industries—at least if you are willing to take the manufacturer's word for it. All of which brings us around to a familiar theme, the hoary old subject of secrecy and its blighting effect on technical progress.

Recently one of our subscribers, a large manufacturer of chemical equipment, had this practice brought rather forcibly to his attention. In writing to an engineer who is also a distinguished authority on the advertising of engineering equipment, the manufacturer had spoken of his reluctance in naming the users of his equipment. He recognized, of course, that the chemical industry was unusually sensitive and secretive about its operations. This called forth the following retort from the advertising counsel:

> I do not know why it is, but, with all due respect to your principal market, the men who are running the chemical industry are as secretive as a one-eyed detective in a small town. Each one seems to think that he has a new and novel method of boiling water or doing something else in chemical work which every other chemical man would give a fortune to know about. In spite of all this, I find that most up-to-date chemical engineers are pretty well posted as to just what the other man is doing regardless of the amount of black crape there may be hanging around the door of the other man. This policy, which seems to be prevalent in the chemical industry, is very regrettable and I think is beginning to pass away. Ten years from now the chemists may act more like gentlemen, with the usual amount of faith in humanity.

Our own contacts with the industry confirm these views only too well, and so, too, do some of the recent experiences of *Chem. & Met.'s* advertising service department. In order to illustrate the copy desired by one of our advertisers, it was suggested that the department obtain photographs of actual installations of certain equipment as it is being used in various chemical and other industrial plants. The usual form letter brought replies from eighty-one concerns, and of this number there were thirty-three favorable answers along with forty-eight refusals. A 40 per cent return on such a venture seemed unusually good, in fact almost

leading us to believe we had effected some conversions of faith among the chemical manufacturers. But a little closer study of these replies showed that we were doomed to be disappointed. Among the affirmative answers, the chemical plants were in a very distinct minority—for sugar, paper, leather and food products comprised over 90 per cent of the group. Of the forty-eight companies unwilling to have photographs taken within their plants, an even thirty were chemical manufacturers. Many reasons and not a few very plausible excuses were advanced, but in a great majority of the cases the request was refused simply because of a fixed policy of secret operations.

It is scarcely necessary to point out that the manufacturers who still cling to this archaic practice are cheating only themselves. Progress is being made all around them. Other industries are contributing an increasing proportion of the recent advances in technology. The chemical industry should not be content to follow.

A Wise Move For Fire Prevention

PROMOTING efficient combustion is perhaps the most universal problem of industry. Naturally, however, the place for that combustion is in furnace or producer, under boiler or sublimer. Once unleashed, fire becomes a menace of terrific fury. The year 1922 witnessed the greatest loss by fire ever known in this country, destroying property valued at $521,000,000. This means that every minute recorded a fire loss of $1,000. And the most tragic loss was not in property but in lives—forty a day throughout the year.

What percentage of this loss in life and property occurred in the chemical engineering industries is not definitely known. With a constant fire or explosion hazard unavoidably present in many plants, it seems certain that the net loss to our industries would figure out to be a considerable percentage of the total. In the lessening of this hazard and consequent fire loss, every chemical engineer should be fundamentally interested.

As in any great work, organization of a solid character is required here for accomplishment of any definite, permanent good to industry. Following the past year of abnormally high losses, the National Fire Protective Association is sponsoring an exposition to be held during the week of Oct. 8 in New York and planned primarily to demonstrate that most of our fire losses are preventable. The other objectives strike at the two main sources of fire loss—ignorance and carelessness. The establishment of suitable and adequate building codes where there are none, the teaching of fire prevention in schools and the systematic inspection by local bureaus of fire prevention are some of the ends to be achieved.

The elements of safeguarding are so many and so varied that there is a definite need for grouping them in relation to one another. This the exposition should and may, to a large extent, accomplish. By a study of the many types of apparatus of which value in eliminating the natural fire hazard or in protecting from conflagration has been proved, the engineer whose major work lies along other lines may fortify himself for safeguarding property under his jurisdiction. While the matter affects every citizen vitally, perhaps no single individual is better fitted to establish precautionary measures than the technical man in our industries.

Eliminating Waste Effort In Utilizing Waste Materials

IN THE course of your operating experience, have you not frequently heard remarks like this: "Joe, what are we going to do with that infernal byproduct over in Z building?" "Why, I don't know, let's send some over to Doc and see if he can't find some way to get rid of it." Doc, as you have guessed, is the research chemist, who proceeds to scratch his head and dig through the literature until, perhaps, something promising develops. The chances are, however, that the application will not measure up to expectations and the problem still remains.

So much of the work on byproduct utilization follows this general procedure (which might be characterized as an attempt to force materials into particular uses, often regardless of their fitness) that it is quite refreshing to find a waste material applied because its properties make it the best available material for a specific purpose.

An excellent example of this sort will be found in our story this week of the preparation of insulating lumber from sugar mill bagasse. Having decided to manufacture an insulating lumber with cellular structure, the originators of this project made a thorough study of all available industrial fibers. As a result, sugar mill bagasse was chosen—not because it was a waste product which ought to be rescued from the ignominious fate of boiler fuel but because it was the best material for the purpose.

Is it not reasonable to conclude that this principle is largely responsible for the overwhelming success of this venture in a field where many others have met with dismal failure or at most have had to be satisfied with mediocre results? We think so, and feel that were this idea more generally followed there would be less effort wasted in fruitless attempts to utilize waste materials.

THIS story is told about one of the Tariff Commission's representatives who was attempting to determine the foreign cost of producing a certain chemical. After searching all over Germany, he finally found a manufacturer who was willing to co-operate with him.

"Vell, chentlemen, I haf decided to giff you mein costs," said he, unrolling several sheets of paper covered with blue ink and tied with a red ribbon.

"Yes, sir, and how much are they?" he was asked.

"One million four hundred and seventy-seven thousand marks."

"Is that per kilo or per ton, Herr ——?"

"Ach! Es macht nichts aus. That all depends on the mark!"

THERE is no mystery like chemistry when it comes to advertising a new hair shampoo or selling a new quenching medium to the metal industry. An enterprising salesman for the Pinkham Chemical Co. of New York recently told one of our metallurgical friends that the latest development in heat-treating is "Metalife," which is "a secret mixture, known only to three persons and containing forty-two different ingredients." The information was also advanced that "chemists at Columbia University had worked 6 months in a vain effort to analyze it."

"Quick, boy! Page Victor K. Cassady, BS., M.S., chief chemist!" He has a rival at last.

Activated Carbon

A Development Shedding Light on Both the Mechanism and the Economics of Adsorption

TO THE production men in the chemical engineering industries activated carbon is still somewhat of a mystery. Before the war bone char and eponite, an excellent wood charcoal from Austria, divided the work of the decolorizing carbons. Other names appeared in commerce fitfully and disappeared. The use of chars for other purposes such as gas adsorption, etc., was relatively an untouched field. Such properties were known and discussed, and an interesting conversation is recalled with one engineer who was anxious to try charcoal in place of nickel in the hydrogenation of oil. Therefore the ideas for the more extended use of chars already existed before suitable carbons had been made.

THEN came the war, that has more often than not marked a new era in production. Activated carbon was found to be a splendid absorbent for poison gas, and the production of the best type of carbon for gas absorption occupied the energy of some of the best chemical engineers in the country. After the war various chars began to appear in commerce —Norit, for example, an excellent char for decolorizing solutions of organic substances, has now numerous bitter enemies because of the foolish overselling carried out by the foreign inventor; Filtchar, Suchar, Darco and others whose reputations are already made for many uses but are still in the formative stage over the whole field. Simultaneously there developed an intense interest in the why and wherefore of char behavior. Production men had been baffled by the contradictory and empirical data on this subject.

WHY was one char satisfactory for a given function whereas another would be infinitely better for a second purpose? Could we predict from its properties what action a char would have? The trail has led into the general field of adsorption and two results may be expected. The first will have to do with the technical value of adsorbents, whether acting in liquid or gaseous phase. The second will mean insight into the fundamental nature and mechanism of adsorption.

OF SUCH nature is the work reported in this issue by Arthur B. Ray. Such research is a happy combination of the theoretical and practical that will send both the engineer and the professor away with a satisfied feeling. The field of adsorption is in many ways the livest region of chemical engineering activity. So many reactions take place in adsorbed layers, so many industries depend on adsorption to make their product marketable, and an ever-increasing number of possibilities present themselves for utilizing this phenomenon that an article discussing its nature, its mechanism and its industrial possibility must strike home to every production man. Here is a live subject; let us have more light upon it!

Modern Methods for Clarifying Fruit Juices

Development of the Fruit Juice Industry Has Emphasized the Importance of Improving Clarification Methods, Since Most Bottled Juices Should Be Brilliantly Clear—A Practical Discussion of Available Processes Is Given in This Article

By W. V. Cruess
Fruit Products Laboratory, University of California

SINCE the passage of prohibition legislation the production of fruit juices and "near" or imitation fruit juices has increased greatly, and the industry has become one of considerable importance. Most fruit juices, to be attractive in appearance, should be brilliantly clear; efficient clarification is an important problem confronting the manufacturer, and much money and effort have been expended in attempting to solve it. Several methods for clarifying fruit juices are in use or have been employed experimentally, of which filtration, "fining," settling and centrifuging are the most important. Electrolysis has been suggested.

Some juice, such as that from oranges, lemons or grape fruit, is dispensed in its natural cloudy condition and requires no filtration other than a rough screening to remove the largest particles of pulp. The fruit flavor of the citrus appears to be in the pulp; clear citrus juice is unsatisfactory as a beverage.

The juice from some fruits, such as apple, pomegranate and certain grapes, can be filtered or otherwise clarified readily. Others, because of the presence of pectin and dissolved colloids, can be filtered only with the greatest difficulty. Concord and muscat grape juices, and berry juices heated too long in contact with the fruit, belong to this class. Therefore a treatment that will clarify one juice may fail with another.

Some juices, containing proteins that coagulate on heating, must be heated and cooled to insure thorough coagulation and agglomeration of these compounds before clarification. Grape juice, some apple juices, pomegranate juice and all berry juices contain these compounds.

Heating juice in contact with fruit pulp and skin greatly increases the content of gummy material and usually adds to the difficulty of clarification. Careless pressing of the crushed fruit causes the juice to contain an excessive amount of suspended matter and renders filtration difficult.

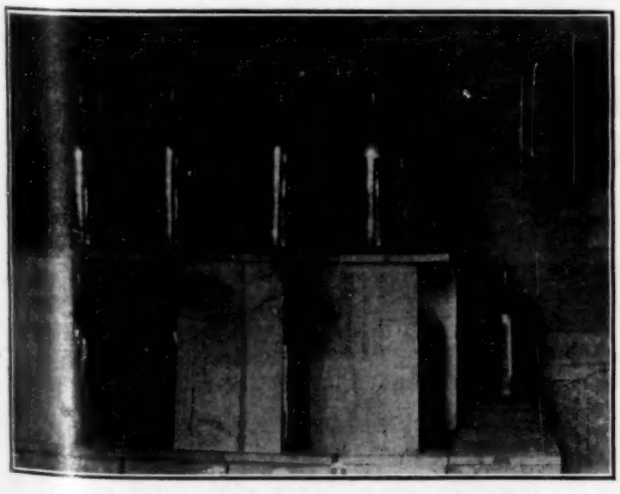

FIG. 1—CARBOYS AND RACKS FOR SETTLING GRAPE JUICE

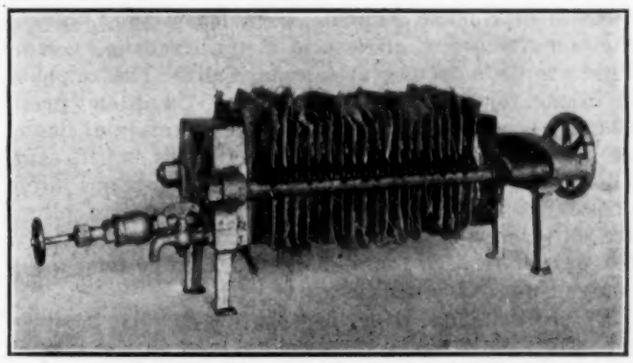

FIG. 2—SMALL FILTER PRESS USED SUCCESSFULLY IN FILTRATION OF JUICES MIXED WITH FILTER-CEL

Clarification by Settling and Racking

Wine, beer and vinegar are often completely or almost completely clarified by allowing sedimentation to occur in casks or tanks; the settled liquids are carefully drawn off (racked) from the sediment. The same principle is applied industrially to the clearing of grape juice and loganberry juice. Grape juice is pasteurized and stored in carboys or barrels until sedimentation is complete and crystallization of excess cream of tartar has occurred. Loganberry juice is stored in large glass-lined steel or wax-coated wooden tanks under refrigeration. Sedimentation alone does not produce a perfectly clear juice in either case, but it is a great aid to filtration or "fining."

Low temperatures favor the crystallization of the cream of tartar formed, which must be removed before bottling, in order to avoid a sandy deposit in the final containers. Fig. 1 illustrates part of a room in which grape juice is settled.

Filtration the Most Important Method

The most important method of clarifying fruit juices is by filtration. The pulp filter is used extensively, the filtering medium being cotton fiber; wood pulp, according to the Karl Kieffer Co., may injure the color or delicate flavor of the product. The cotton pulp is broken up in water and pressed into thick disks. These are placed in a metal cylinder and separated by screens in such manner that each disk acts as an independent filter. The juice is forced through by gravity from an overhead supply tank or by means of a centrifugal or rotary pump. For rough filtration the pulp is lightly

compressed; for brilliant filtration it is compressed tightly. Often two filtrations are given—one through loose pulp to remove most of the suspended matter, and a second through tightly packed pulp to render the liquid brilliantly clear. A Kieffer filter is in use in our laboratory for juice filtration and has given excellent service. (See Fig. 4.)

Other types of pulp filters, such as the "Dutch" filter, are in use; but they are less convenient and do not withstand so high a filtering pressure as does the disk-type filter. A simple pulp filter, acting on the principle of the Büchner funnel, operated by a water-jet suction pump, will filter 10 to 25 gal. of juice per hour. (See Fig. 3.)

An Oliver vacuum filter is used with success for the removal of calcium sulphate from lemon juice during the manufacture of citric acid in the Exchange Lemon Products Co.'s factory at Corona, Calif. The sulphate is in the form of small crystals. A Sweetland press has also been used at Corona for the filtration of liquor at various stages in the manufacture of citric acid. The Sperry, Shriver and other plate-and-frame filter presses have also been used successfully. Bag filters are satisfactory for rough filtration. In the laboratory, felt bags have been found more satisfactory than those made of duck or other cloth.

Filters using asbestos fiber packed against a silver screen of fine mesh were formerly used in the United States for the filtration of beer and wine; the Seitz filter is a good example. Brilliantly clear filtrates are obtainable thus, but at present it is difficult to purchase the proper grade of asbestos fiber, as the filters are of German manufacture.

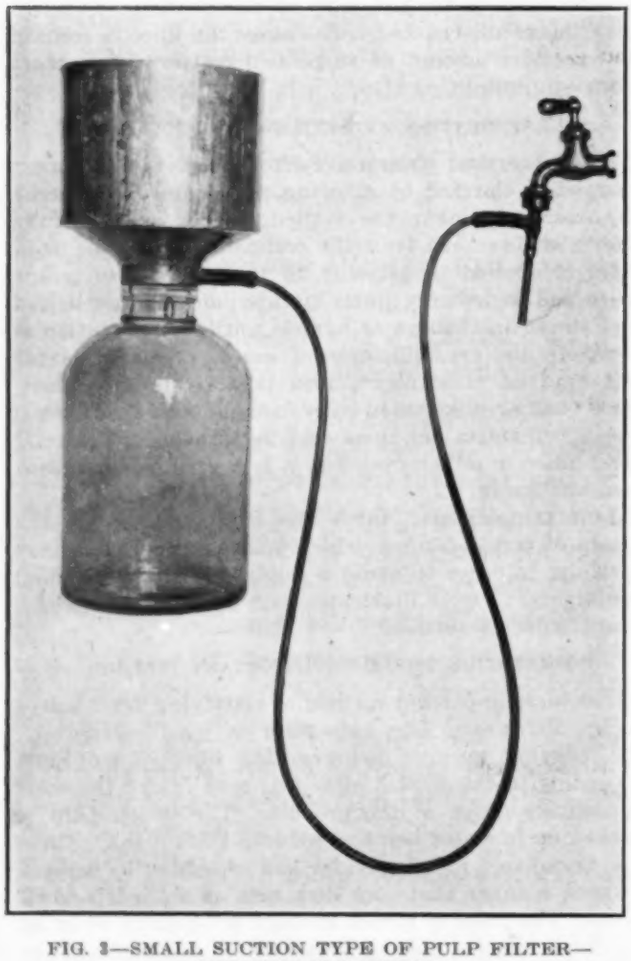

FIG. 3—SMALL SUCTION TYPE OF PULP FILTER—THE CELLULO FILTER

Filter Aids Have Revolutionized Filtration Practice

In recent years filtration practice has been revolutionized by the use of filter aids. The most important of these is infusorial earth, prepared by grinding the raw product and by separating the fine material by air filtration or by sifting. The earth is of low specific gravity and of fluffy, flourlike texture; it is nearly pure SiO_2. The chambered skeletons have great power of agglomerating or adsorbing finely divided suspended matter. The filtration of fruit juices is facilitated by the addition of even a small amount of the earth; we use from ¼ to 1 per cent of the earth, by weight.

A well-known variety of the earth is prepared at Lompoc, Calif., and sold as Filter-Cel. The usual grade of raw Filter-Cel imparts an earthy taste to the juice, but this can be avoided by preliminaray washing in water. This is easily accomplished by pulping the earth with water and pumping the mixture into a filter press until the cloths are coated. Water is then passed through the press until all taste is removed. The filtering surface is allowed to remain on the cloths, and a small amount of the washed earth is mixed with the juice to be filtered. Filter-Cel that has been treated at the factory to remove or destroy the earthy taste is now available, and washing is no longer necessary.

The earth gives a brilliantly clear filtrate and does not noticeably impair the flavor of the juice of grape or apple, it has been found. It is more readily used in filter presses than in vacuum filters or in filter bags. The small press shown in Fig. 2 was used in our experiments.

Caldwell (U. S. Dept. Agric. Bull. 1025) recommends building up a thick layer of the earth on a fine metal screen and using this as a filtering medium for fruit juices. He reports satisfactoroy results.

Centrifugal Clarification

The cream separator and the supercentrifuge have each been applied successfully to the clearing of juices. In the Exchange Orange Products factory at San Dimas, Calif., orange juice is partly clarified in a De Laval cream separator; the sediment collects in the bowl, which must be cleaned occasionally.

A hand-power Sharples clarifier, at 15,000 r.p.m., has been used successfully in this laboratory for clearing orange juice for the preparation of sirup; and a laboratory supercentrifuge, at 30,000 r.p.m., for clarifying orange and other juices. Two or three treatments, or slow feeding and one treatment, gave a fairly but not brilliantly clear liquid. An apple-juice bottler in Los Angeles uses a Sharples clarifier for orange, lemon or apple juice and is satisfied with results.

A centrifuge would be of considerable value in the filtration of fruit juice. The only objections that I can see to it are the excessive aëration and probable oxidation.

Filtration through a cloth lining around the basket of a centrifuge in a California grape-juice factory was found to be slow and imperfect.

Effect of Metal on Fruit Juices

Silver has been found to be the best metal for coating the inner surface of filters, centrifuges and other equipment with which fruit juice comes in contact.

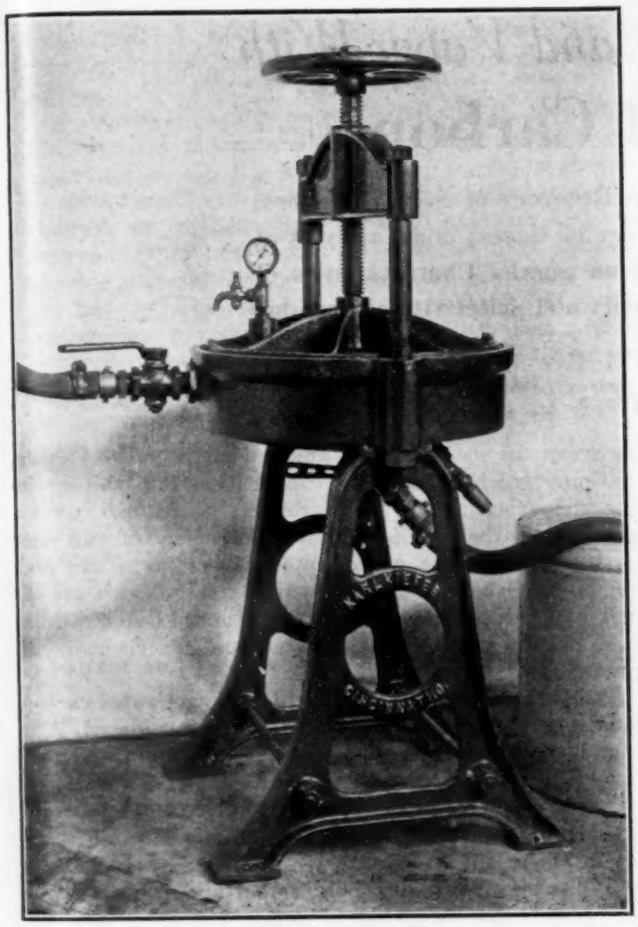

FIG. 4—TWO-DISK ("DIACEL") TYPE OF PULP FILTER

Aluminum is also satisfactory, except for its tendency to pit.

Tin is apt to cause the red color of acid juice to become purple or blue. Iron and steel react vigorously with the acid of fruit juice, and with tannin give a blue or black color. Copper is not as satisfactory as silver, but is generally preferable to tin. Bronze is fairly satisfactory. Monel metal is resistant and could be used to advantage. Glass-lined steel is desirable for kettles, pipes and tanks.

Clarification by Fining

The "fining" of fruit juice consists in adding a substance which will be coagulated by compounds in the juice, or by heat, and which will then settle, giving a compact sediment in which is occluded the finely divided material responsible for the cloudiness of the juice.

Casein, dissolved in dilute ammonium hydroxide and boiled until free of NH_3 odor, has been used successfully for "fining" grape juice in California. A 1 to 2 per cent solution is mixed with the juice at the rate of 100 to 200 grams of casein per hectoliter—1 to 2 grams per liter. The acid of the juice precipitates the casein. If the "fining" is successful, the coagulated casein settles rapidly, giving a granular deposit and a clear supernatant liquid. Juice which has been "fined" filters rapidly.

Egg albumen (as a 1 per cent solution in water) is sometimes added to the juice at the rate of about 1 gram of the dry albumen per liter; the mixture is heated to 175 to 185 deg. F. and stored in barrels for several weeks. Coagulation is not always complete, resulting in the precipitation of a protein haze in the bottled juice.

Summary

1. Most bottled fruit juices should be brilliantly clear.
2. Filtration through cotton pulp is one of the best methods of clarification.
3. If filter presses are employed, infusorial earth should be mixed with the juice to aid filtration and to produce a brilliantly clear filtrate.
4. Centrifugal action or bag filtration can be used for preliminary treatment to remove coarse suspended matter.
5. Clarification by the use of "fining" is not so successful as filtration.

Asbestos Production Drops Sharply

In 1922 the domestic asbestos industry of the United States came to a standstill, according to a statement from the Department of the Interior through the Geological Survey. Only 67 short tons of all varieties of asbestos, valued at $10,120 was produced in 1922, as compared with 831 tons, valued at $336,968, in 1921, and 1,648 tons, valued at $678,231, in 1920.

The Arizona field is the most promising in the United States. The industry there was developed rapidly from a small initial production in 1914 to its maximum in 1920, when it supplied asbestos worth 96 per cent of the total value of the domestic asbestos marketed. This great increase was due to a steady rise in the price of "crudes," which reached a maximum late in 1920 and early in 1921. In 1921 the general business depression greatly decreased the demand for asbestos and prices fell continuously throughout the year. In 1922 the plight of the Arizona miners was made worse by a further decrease in prices, due in part to keen competition with chrysotile from Rhodesia. The prices of "crudes" during the last 5 months have been remarkably constant, No. 1 Canadian being quoted at $500 and No. 2 at an average of about $290. Each of these prices is about 80 per cent higher than the pre-war figures.

Information received from several sources indicates that there will probably be increased activity in mining asbestos in Arizona in the second half of 1923. Many deposits have been located within the San Carlos and Fort Apache Indian reservations, which were thrown open for entry only in 1921. Some of these deposits are under lease from the Bureau of Indian Affairs and have been partly developed. Outside the reservations there are several deposits, which have been extensively developed but on which operations were suspended in 1922.

One of the chief difficulties in marketing Arizona asbestos has been the work of bringing the producer and the consumer together. To assist in this work the Geological Survey recently made a canvass of the stocks of Arizona asbestos on hand. The returns show that there was ready for shipment 312 tons of "crudes," distributed as follows: No. 1 (including some 1-A), 77½ tons; No. 2, 194½ tons; No. 3 (including some No. 4), 40 tons. Some of these stocks were in lots as large as 130 tons and one included as much as 90 tons of one grade.

Industrial Adsorption of Gas and Vapor With Activated Carbon

Wide Commercial Applications in Recovery of Solvent Vapors; Separation, Purification and Storage of Gases; and Catalysis of Reactions Are Shown to Depend on Special Characteristics of Physical Structure, Sorptive Capacity and Selectivity of Sorption

By Arthur B. Ray
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ACTIVATED CARBON of suitable characteristics has great value as a gas and vapor adsorbent. Its war-time record in protecting against poison gases by adsorbing them and so removing them from the air which was breathed is too well known to require elaboration here. Many a soldier owes his life to a half pound of activated carbon held in a gas-mask canister. In industrial gas masks it is now protecting workmen against all sorts of organic vapors and is permitting firemen to work in smoke and fumes with safety. It is being used to remove impurities from all varieties of gases used in the industries. It is preventing the escape of objectionable odors from industrial processes. While it has many applications for the adsorption of objectionable substances which it is desired to get rid of, it also has very important applications in the recovery of valuable substances. By its use thousands of gallons of gasoline are being most effectively extracted from natural gas. Benzol and light oils are recovered from coke-oven gas by it. An application which bids fair to be of the utmost industrial importance is the recovery of the immense amount of valuable volatile solvents which are lost by evaporation into the air in the manufacture of such products as rubber goods, artificial leather, celluloid, etc. A review of the successful applications of activated carbon as a gas and vapor adsorbent, a few of which are indicated above, and a consideration of its many possible applications lead one to realize that this unique adsorbent is of great industrial value.

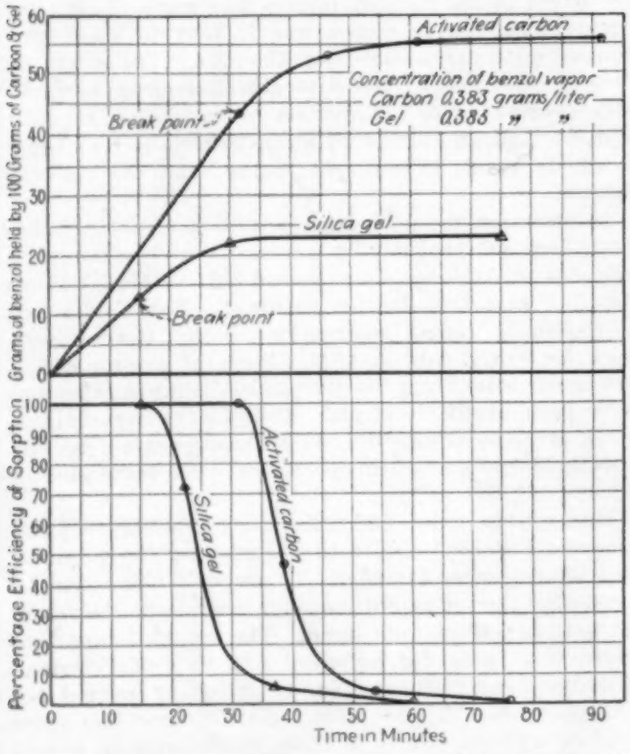

FIG. 1—SORPTION OF BENZOL VAPOR FROM DRY AIR BY COLUMBIA ACTIVATED CARBON AND SILICA GEL.

Equal volumes (30 c.c.) of 8-14 mesh carbon and gel compared. Air-benzol mixture passed at rate of 500 c.c./min. Temperature, 25 deg. C.

When the conditions under which the activated carbon must operate in the various fields are considered, it is found that, in order to be used successfully and economically, it must have certain well-defined qualifications as to physical structure, sorptive capacity and selectivity of sorption and that it must allow the substances to be rather easily removed. In this paper the author will discuss the industrially important properties of gas adsorbents somewhat in detail and show how the unique highly activated carbon prepared by the Chaney process (1)* possesses particularly desirable characteristics for numerous applications.

Essential Characteristics of Gas-Adsorbing Carbons

Physical Structure

In nearly all of the industrial applications of gas-adsorbing carbon it is necessary to bring large volumes of gases in contact with the carbon. This is generally done by causing the gases to pass through a bed of the granular material. We may, for example, have a few ounces of carbon held in a gas mask canister or several thousand pounds held in a gasoline recovery tower, but there are certain characteristics of physical structure which the carbon in each case must possess.

Mechanical strength is one of the essential characteristics. The granular carbon must resist the crushing and abrading action due, in the case of the gas mask, to jolting and bumping during transportation and use, or, in the case of the gasoline recovery tower, to pressure of its own mass and to the action of gases passing through it at high velocity. A soft or extremely brittle carbon would be unsatisfactory for either case, because it would break down and "dust." The fine particles formed would seriously interfere with the operation of the mask or gasoline absorber because they would increase the resistance to passage of air or gas. In the case of the large absorber there would also be a gradual loss of the carbon fines which would be carried away by the gas stream. By actually determining the relative ability of carbons, which were prepared from a great variety of raw materials, to withstand crushing and abrading action, it has been found that there are rela-

*Figures in parentheses refer to bibliography at the end of this article.

tively few raw materials which can be used for the manufacture of a satisfactory hard and tough granular carbon.

A relatively high apparent density is another essential physical characteristic. The most efficient gas-adsorbing carbon has only sufficient capillary porosity to allow a maximum of active carbon to be exposed. The channels or capillaries are of small diameter and very numerous. It has been demonstrated that activated coconut charcoal having the maximum adsorptive power per unit of volume has a block density of 0.66, which corresponds to an apparent density of 0.41 for particles of 8 to 10 mesh size range. The Columbia activated carbon produced commercially for gas adsorption has an apparent density of approximately 0.52 for 8 to 14 mesh size range and weighs 32.5 lb. per cu.ft.

The desirability of a relatively high density precludes the use of low-density raw materials for the manufacture of gas-adsorbing carbons and explains why such dense materials as nut and fruit pit charcoals, anthracite coal and synthetic cokes have been generally sought. A granular activated carbon made from wood charcoal, such as the German product, has of necessity a low apparent density. Actually the German product weighs 16.5 lb. to the cu.ft. and is quite easily crushed.

Sorptive Capacity

The fact that activated carbon holds gases and vapors in two different ways has already been pointed out. The total amount held when the carbon is exposed in the pure gas or vapor consists of the amount held rather loosely by capillary condensation and more firmly by the specific attractive forces of the activated carbon. Our method of evaluating gas-adsorbing carbons (2) enables both the total sorptive capacity or "saturation" value and specific adsorptive capacity or "retentivity" to be readily determined. The saturation value is obtained by exposing the dried and evacuated carbon in an excess of pure vapor at, say, 25 deg. C. The amount retained when the saturated carbon is moderately heated and evacuated is a measure of the specific attractive forces or retentivity. The difference between these values represents the vapor held loosely by capillary action. Some comparative values obtained by this testing method are given in Table I.

TABLE I—SORPTIVE CAPACITY OF ACTIVATED CARBONS AND OTHER SUBSTANCES

Saturation in pure vapor at 25 deg. C. Retentivity at 100 deg. C. and 3 mm. Hg pressure.

Substance	Apparent Density 8-14 Mesh	Sorptive Capacity Expressed as Grams CCl_4 Held by 100 Grams Sorbent: Total	Capillary	Specific
Activated Carbon—A	0.465	110.9	80.9	30.0
Activated Carbon—B	0.500	103.8	75.3	28.5
Activated Carbon—C	0.542	95.7	68.7	27.0
Activated Carbon—D	0.560	79.5	51.5	28.0
Silica Gel —A	0.720	19.8	17.8	2.0
Silica Gel —B	0.700	39.2	37.7	1.5
Sil-O-Cel	.....	12.3	10.3	2.0

It is seen that for highly activated carbon the specific capacity which is determined by the amount of exposed activated carbon tends to reach a maximum, but that the capillary capacity varies with the porosity (shown inversely by apparent densities). The very small specific adsorptive capacity of such porous bodies as silica gel and Sil-O-Cel for such an organic vapor as carbon tetrachloride is evident. This fact has also been pointed out by Prof. Henry Briggs (3), who concludes from his comparative experiments with activated carbon and silica gel as gas adsorbents that "the specific attraction —i.e., the force subsisting between the solid and the gas molecules—is much greater with charcoal than with silica."

The significance of these sorptive characteristics in the commercial use of the adsorbents is plain. When the concentration of the gases or vapors to be sorbed is high, the total sorptive capacity is important and the value of the adsorbent, leaving out of consideration other factors, is determined by its saturation value. But when the concentration of the gases or vapors to be adsorbed is low, which is the most common occurrence, the value of the adsorbent is largely measured by its specific capacity or retentivity. This point is also brought out Professor Briggs (4), who shows that by reason of its specific attractive power, activated carbon has a very great "prehensility" or "ability" to abstract small proportions of vapor from the air.

The extent to which differences in sorptive characteristics affect the ability of activated carbon and silica gel to remove benzol vapors from dry air is shown by the typical curves given in Fig. 1 and the comparative data presented in Table II.

TABLE II—SORPTION OF BENZOL FROM DRY AIR BY ACTIVATED CARBON AND SILICA GEL

Equal volumes (30 c.c.) of 8-14 mesh carbon and gel used. Temperature 25 deg. C.

Sorbent	Conc. of Vapor Gram/ Liter	Rate of Flow c.c. / Min.	Time to Break-point Min.	Grams of Solvent Held At Breakpoint by 100 grams	100 c.c.	At Saturation by 100 grams	100 c.c.
Carbon—A	0.383	500	31.5	43.39	20.83	55.94	26.85
Gel —B	0.383	500	15.0	12.83	9.24	22.94	16.52
Carbon—B	0.370	500	32.0	37.86	18.93	47.50	23.85
Carbon—C	0.403	500	23.5	32.93	16.47	48.35	22.66
Carbon—D	0.383	500	22.0	25.30	13.17	33.80	18.93
Gel —A	0.392	500	4.63	4.08	3.26	12.69	10.15
Carbon—B	0.084	1000	50.75	32.00	16.00	39.39	19.70
Gel —B	0.088	1000	23.50	9.41	6.77	19.36	13.94
Carbon—D	0.092	1000	42.00	23.69	13.03	30.39	16.71
Gel —A	0.092	1000	9.13	3.63	2.90	11.63	9.30

In obtaining the data, equal volumes of carbons and gels are held in U-tubes of equal diameter, immersed in water kept at 25 deg. C., while the dry air containing benzol vapor was passed through. The carbons used were highly active coconut charcoal. The silica gels were purchased directly from the manufacturer at different times and were carefully dried before using by heating at 200 deg. C. in a stream of air.

Up to the "breakpoint" the carbon and gel are 100 per cent efficient for removing the benzol vapor from the air, but beyond this point the efficiency of removal rapidly drops off. It is quite obvious that in order to determine the relative values of sorbents for removing vapors from gases a comparison of their sorptive capacity at the breakpoint is of utmost importance. These values will be affected somewhat by size of particles, depth of bed, rate of passage of gas, concentration of vapors, etc., but are always lower than the total saturation values.

The comparative data presented show quite conclusively that activated carbon, by reason of its larger total and specific adsorptive capacity, is markedly superior to silica gel for recovering such a vapor as benzol present in high concentration in dry air, both of which conditions are particularly favorable to the gel. Similar comparative tests on the recovery of other solvents show the superiority of the carbon in every case. Highly activated carbon always has a higher total sorptive capacity than the best gels, but, what is much more important, it has a very much greater specific adsorptive capacity and therefore holds a much greater amount of solvent at the "breakpoint" when the concentration

is extremely low. Further advantages of the unique sorptive characteristics possessed by activated carbon will be pointed out in connection with a discussion of typical applications.

Selectivity of Adsorption

It has been stated as a general rule that gases and vapors are sorbed in the order of their boiling points, but there are numerous exceptions to this rule. The chemical nature of the gases and vapors has a considerable effect upon the order of their adsorption—the more reactive substances being usually preferentially adsorbed by activated carbon. While the differences in the adsorption of different gases are largely accounted for by differences in physical and chemical characteristics of the gases themselves, there is in some cases also a specific chemical attractive force between adsorbent and gas or vapor, due to the chemical nature of the adsorbent, which is of very great importance in accounting for selectivity of adsorption. Silica gel, for instance, takes up water vapor in preference to hydrocarbon vapors and holds it tenaciously. Activated carbon, on the other hand, takes up hydrocarbon vapors in preference to water vapor. The selective action of these substances may be easily demonstrated by shaking them with water and gasoline. An experiment in which 25 grams each of activated carbon and gel were shaken with equal parts of water and gasoline showed that roughly the gel took up 13 c.c. of water, while the carbon took up 23 c.c. of gasoline. The result is approximately the same if the gel is first saturated with gasoline and the carbon with water. This striking difference in selective action may be largely accounted for by the chemical nature of the carbon and gel. Our retentivity measurements show that water is not adsorbed by carbon as are other vapors, although it does hold large amounts at saturation. It had also been shown (5) by measurements of the isothermal sorption of water vapor by charcoal at 25 deg. C. that activated carbon does not adsorb water, but holds it merely by capillary action.

TABLE III—PREFERENTIAL SORPTION OF BENZOL AND WATER VAPOR BY ACTIVATED CARBON AND SILICA GEL

Equal volumes of 8-14 mesh carbon and gel used. Dry air containing benzol or air containing approximately equal parts by weight of water vapor and benzol passed at rate of 3,000 c.c. per minute.

Sorbent	Weight of Sorbent Grams	Air	Conc. of Benzol Grams /Liter	Breakpoint Time Min.	Breakpoint Benzol Held Per Cent	Saturation Time Min.	Saturation Benzol Held Per Cent
Carbon—B	33	Dry	0.0133	230	27.8	....	....
Carbon—B	33	Dry	0.017	207	31.9	420	34.9
Gel —B	50	Dry	0.0134	62	5.0	420	12.0
Gel —B	50	Dry	0.0137	68	5.6	....	....
Carbon—B	33	Moist	0.0142	166	21.2	....	....
Carbon—B	33	Moist	0.0142	162	20.9	420	27.3
Gel —B	50	Moist	0.0135	29	2.4	420	0.0
Gel —B	50	Moist	0.0178	28	3.0	420	0.0

Note — The amount of benzol adsorbed from moist air was determined by removing it from the sorbent by steam and weighing it.

This difference in preferential adsorption exhibited by carbon and gel is particularly important from the standpoint of certain industrial applications, such as, for instance, solvent recovery from air and gasoline recovery from natural gas. When water vapor is present along with a hydrocarbon vapor the gel becomes saturated with the water vapor in preference to the hydrocarbon vapor, whereas the reverse is true of carbon. In comparative tests air containing approximately equal amounts of water vapor and benzol was passed at the same rate through equal volumes of 8-14 mesh carbon and gel. The results obtained are given in Table III.

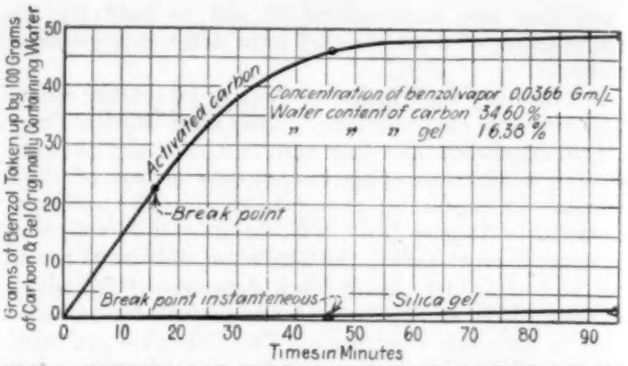

FIG. 2—SORPTION OF BENZOL VAPOR FROM DRY AIR BY COLUMBIA ACTIVATED CARBON AND SILICA GEL CONTAINING WATER

Air containing benzol vapors passed at rate of 500 c.c./min. over equal volumes of carbon and gel. Temperature, 25 deg. C.

It is seen that the carbon effectively adsorbs benzol in the presence of water vapor, whereas the gel is ineffective as an adsorbent under this condition. In practically all cases where it is desired to use an adsorbent for removing vapors from gases water vapor is present. Water vapor is always present along with solvent vapors in air or with gasoline in natural gas, to mention two large fields for the use of adsorbents. The advantages of an adsorbent such as activated carbon which preferentially adsorbs the hydrocarbon vapors are obvious.

It is shown by the curves in Fig. 2 that when benzol vapor is passed over carbon and gel which holds sorbed water vapor the carbon releases the water and takes up the benzol, whereas the gel takes up no benzol until it has been partially dried by the air current. This means that very great precautions must be taken to dry the gel after steaming out the sorbed solvent, because gel containing sorbed water vapor is quite evidently worthless as a sorbent for hydrocarbon vapors. Carbon, on the other hand, will actually adsorb hydrocarbon vapors, even though it is dripping wet with water.

Recovery of Sorbed Vapors and Gases

When the activated carbon is used to adsorb vapors which it is desired to recover, the problem of removing the sorbed vapors and putting the carbon in condition again to adsorb vapors must be considered. It has been intimated by some that the vapors which are held firmly at ordinary temperatures by the specific adsorptive power of the carbon are removed with difficulty. Actually, however, we find that the adsorptive power is sufficiently decreased at temperatures ranging from 100 to 150 deg. C. to allow the easy removal of the vapors and gases which it is desired to recover industrially. Heat may be applied by means of hot gases, vapors or liquids or indirectly by means of steam coils and the like. If heat is applied indirectly, the removal of vapor is facilitated by reducing the pressure.

In the case of vapors and gases which are not appreciably soluble in water, steam or other hot vapors, or hot water introduced directly on the saturated carbon will effectively heat the carbon and cause the removal of the sorbed vapors or gases. For the effective removal of low-boiling substances such as the various hydrocarbon gases and volatile solvents the steam or hot water need not be over 100 deg. C. The idea that superheated steam must be used to cause the removal of such substances as natural-gas gasoline and benzol is entirely erroneous, as has been proved by laboratory tests and commercial

practice. Low-pressure saturated steam is used with complete success at all the commercial gasoline recovery plants for removing the gasoline from the carbon, and it has been demonstrated that the removal of the gasoline constituents from the carbon under these conditions is satisfactorily complete.

The results of some laboratory tests on the removal of benzol from activated carbon by saturated steam are shown by Fig. 3. In making the tests wet steam was merely passed through the saturated sorbent held in a steam-jacketed tube of small diameter and the vapors then condensed and run into a receiver vented through activated carbon. It is evident that carbon readily releases the benzol. Similar comparative tests with other solvents show quite conclusively that most sorbed vapors can be removed from carbon without difficulty.

After the steaming process the sorbents contain water, which is no great disadvantage as far as the carbon is concerned, because wet carbon will preferentially adsorb hydrocarbon vapors. Wet gel, however, has no adsorptive power whatever for hydrocarbon vapors and so must be carefully dried by heating in a current of dry air or gas at 125 deg. C. or above and then cooled before it can be re-used. In the tests it was noticed that the gel was often reduced to a powder by having become saturated with water too rapidly. This shattering of the gel granules when liquid is rapidly adsorbed is mentioned by Miller (7). It is possible that this property of gel would cause considerable difficulty in commercial practice, because if saturated steam or even superheated

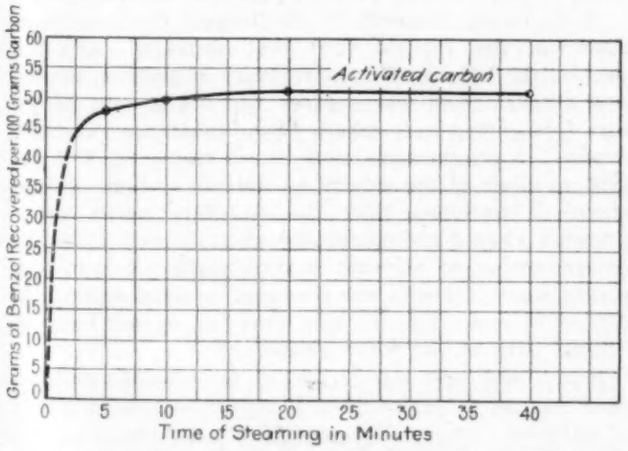

FIG. 3—REMOVAL OF SORBED BENZOL FROM ACTIVATED CARBON BY WET STEAM

Wet steam passed through carbon and benzol recovered from condensate. Benzol held by carbon at saturation, 57 per cent by weight. Recovery from 50 grams of carbon as follows:

Time	Water Condensed	Benzol Recovered	Percentage Recovery
5 Min.	51 Grams	23.86 Grams	83.71%
10 Min.	92 Grams	24.75 Grams	86.84%
20 Min.	194 Grams	25.55 Grams	89.47%
40 Min.	347 Grams	25.55 Grams	89.47%

steam were used to cause the liberation of the sorbed vapors, condensation would unavoidably allow the gel to come in contact with water.

On the other hand, activated carbon is not affected by water and may be quickly cooled after the steaming operation by sluicing it with cold water and may then, if necessary, be immediately put into service again without any drying whatever. The dripping wet carbon or carbon containing a large percentage of water is almost as effective an adsorbent for hydrocarbon vapors as is dry carbon. In recovering sorbed vapors by means of steam there are obvious advantages in having a sorbent material which is not physically affected by contact with water and which does not have to be carefully and completely dried and then cooled to make it ready for re-use.

In the case of those vapors which are readily soluble in water, their removal by steam is also possible. In laboratory tests of the removal of acetone from carbon by steam, a large part of that removed was condensed practically free from water. This means that only a part of the recovered solvent would have to be rectified. The recovery of the solvent by heating directly by such a medium as steam has economic advantages and under certain conditions, even though the recovered solvent has to be rectified, may be the most economical method of recovery.

If it is desired to recover water-soluble solvents free from water, it is necessary to heat the carbon by means of steam coils, by passing hot gases through it or by some other means such as immersing it in a hot liquid metal (8). Drawing a vacuum upon the carbon while it is being heated aids in causing the removal of sorbed vapors. That the ordinary water-soluble solvents which it is desired to recover commercially are readily released when the carbon is heated at 150 deg. C. is shown by the results of laboratory tests given in Table IV. The saturations were quickly obtained by pouring the liquid over the solvent and allowing the excess to evaporate at room temperature. Surprisingly close checks can be obtained by this method, but no great accuracy is claimed.

TABLE IV—REMOVAL OF SORBED VAPORS FROM ACTIVATED CARBON BY HEATING

Saturated carbon exposed in a thin layer in a ventilated oven and heated for 1 hour at 150 deg. C.

Solvent	Percentage Solvent Held at Saturation by Carbon B	Percentage Solvent Retained at 150 deg. C. by Carbon
Methanol	50.0	1.21
Ethanol	50.0	1.05
Isopropanol	50.0	1.15
Ethyl Acetate	57.5	4.87
Acetone	51.0	2.93
Acetic Acid	70.0	2.23

It is evident that at 150 deg. C. the carbon readily releases vapors which are strongly adsorbed at a lower temperature. In fact, most of the vapors are quite readily released at temperatures between 100 and 150 deg. C. The only difficulty is in getting the mass of carbon heated, since it has a relatively low heat conductivity. Fairly satisfactory methods for doing this have been devised, however. It is pointed out in this connection that the chances of fire or explosion when vapors are driven out at such relatively low temperatures are very small. In making hundreds of laboratory tests we have never had an explosion or fire even when air at 250 deg. C. was passed over carbon containing flammable vapors. If necessary, heating in the presence of a neutral or a reducing gas can be resorted to.

Commercial Applications of Gas-Adsorbing Carbon

Some of the general fields in which the gas-adsorbing type of activated carbon is commercially important have been already named. Many of the particular applications have been discussed in detail in the journal and patent literature, so the present discussion will be limited to general principles of the more important application in various fields. These applications may be grouped under the following headings:

(1) Separation and recovery of gases and vapors.
(2) Purification of gases.

(3) Storage of gases.
(4) Catalyst.
(5) Production of high vacua.

Separation and Recovery of Gases and Vapors

Gasoline recovery from natural gas is commercially accomplished by the use of activated carbon. According to recent advices, there are now nine plants in operation which treat 83 million cubic feet and recover 18 thousand gallons of gasoline per day. Twelve other plants are being installed which will treat 180 million cubic feet of gas per day. The charcoal gasoline recovery process is undoubtedly a technical and economic success. Detailed description of the process and information concerning its operation has been published elsewhere (9-18). The natural gas is passed through a bed of carbon held in such a container as is pictured in Fig. 4 for such a time as the gasoline constituents are completely removed. Saturated steam at 15 lb. pressure is then passed into this absorber and as gasoline is distilled out, condensed in water-cooled condensers, and blended for the market. In each plant now operating there are three such absorbers. While one is being steamed out, gas is directed through the two others, the denuded gas from one cooling the other which has just been steamed. With the exception of turning the valves at the end of every cycle the whole plant is operated automatically. It is claimed by G. A. Burrell, G. G. Oberfell and C. V. Voress (16) that "a charcoal gasoline recovery plant costs less to install, is cheaper to operate and produces more and better grade of gasoline then compression or oil absorbing plants."

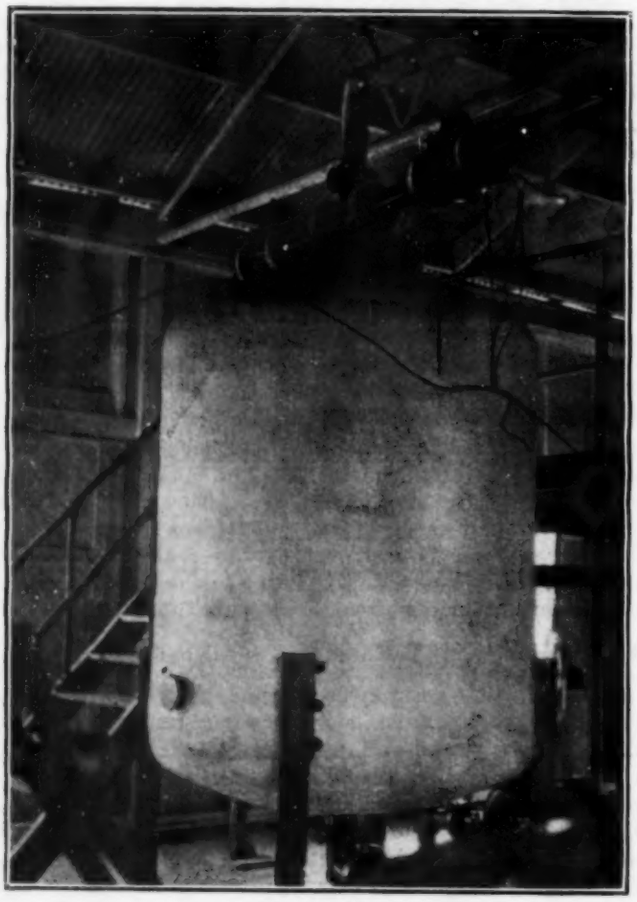

FIG. 4—ACTIVATED CARBON ADSORBER USED IN NATURAL-GAS GASOLINE INDUSTRY

Activated carbon may also be successfully used to recover gasoline ordinarly lost in cracking processes and by evaporation from storage tanks.

The recovery of solvents such as petroleum ether, benzol, sulphuric ether, alcohol, etc., which are evaporated and disseminated through the air in various commercial operations, may be successfully accomplished by means of activated carbon. Activated carbon is particularly suited for solvent recovery because of its unique power to adsorb vapors present in very low concentration, its preferential adsorption of solvent vapors in the presence of water vapor, its high adsorptive capacity and the ease with which the adsorbed vapors may be recovered. The commercial installations will differ somewhat in design and operation because of the different factory conditions and nature of solvents to be recovered. It is necessary only to direct the undried air carrying the solvent vapor through carbon absorbers arranged in such a manner that while one is being distilled others are absorbing. It is believed that activated carbon is the most effective adsorbent available for all the common solvents and that the recovery process employing carbon is both highly effective and safe. In this connection it is interesting to note that in experiments regarding the separation of volatile substances from gases (19) activated carbon is found to be superior to either cresol or paraffine oil as an absorbent for benzol and carbon tetrachloride. For low concentration of volatile substances activated carbon is stated to be far superior to cresol.

A. L. Davis, formerly of the Bregeat Corporation of America, also reports (20) that activated carbon is particularly efficient for the recovery of acetone, butanol and ethanol from waste gases which pass out of the corn-fermenting vats where these substances are produced. In comparative tests cresol recovered 89.4 per cent as much of the solvent as did the carbon. It was stated in conclusion that "the use of activated carbon presents a rapid and reasonably accurate method for the determination of solvents in practically all industrial plants where solvents are produced or used where conditions of operation are such that the solvent becomes diluted with air or other gases."

Benzol and light oils as well as naphthalene and sulphur may be extracted from illuminating gas by means of activated carbon. The gas is first scrubbed to remove the tar, ammonia and cyanogen compounds and is then passed through a series of absorbers containing activated carbon. The first absorber takes up all the condensible vapors and gases at the beginning of adsorption, but eventually the ethylene is replaced by benzene and its homologs, which are recovered by distillation with steam. The gases from the first absorber are mixed with a small amount of air and passed to the second absorber, in which the sulphur is deposited by reason of the catalytic action of active carbon upon hydrogen sulphide and oxygen. The sulphur may be removed from the carbon by suitable solvents such as ammonium sulphide, dichlorbenzol, tetralin, etc.

Various modifications of this general process have been described in the literature (21-26) and an installation for recovering the benzol only (27) is reported to operate quite satisfactorily. It is stated that the "whole installation works quite simply without mechanism of any kind, so is easy of supervision. It is made of a simple sheet metal without heavy cast parts and the space required is inconsiderable." Absolutely all the

benzol is recovered from the gas and the gas is also absolutely freed from naphthalene. The carbon used in this installation held 25 per cent by weight of benzol at saturation, whereas our carbon holds around 50 per cent.

The abatement of industrial stenches by means of activated carbon is readily accomplished. A commercial installation in operation at the present time at a fat-rendering plant is a decided success (27a).

Some of the other applications to gas separation and purification may be enumerated as follows:

(1) Removing noxious and toxic vapors from air by military and industrial gas masks (28-30).

(2) Purifying carbon dioxide to be used for carbonating water.

(3) Purifying hydrogen used in hydrogenation.

(4) Purifying ammonia before it enters oxidation catalyzer.

(5) Deodorizing confined spaces such as refrigerators and submarines.

(6) Purifying helium (31).

(7) Recovering sulphur dioxide.

(8) Recovering oxides or nitrogen.

(9) Drying gases.

(10) Purifying acetylene.

Storage of Gases

Use of activated carbon in the *storage of compressed gases* may be of considerable commercial importance. The adsorptive capacity of carbon determines its value for this application. A cylinder containing activated carbon has a greater capacity for gases under pressure than when containing no carbon. It has been shown (32), for instance, that "a cylinder charged with nitrogen at 35 atmospheres has its capacity increased by 66 per cent by filling it with activated coconut charcoal." Of the substances tried activated coconut charcoal had the greatest adsorption under pressure.

The purification and storage of nickel carbonyl (33) used in hydrogenating oils can be accomplished by means of activated carbon.

Catalyzing Reactions

The oxidation of hydrogen sulphide to give free sulphur (34-37) and thus the resulting purification of illuminating gas is readily accomplished by activated carbon. The gas with a little air, oxygen or sulphur dioxide is passed over the carbon and deposited sulphur removed by suitable solvents (38). The process is also applicable to production of sulphur as a byproduct of certain industrial processes. It is stated (34) that the advantages of the process for purifying illuminating gas are as follows: "The process is distinguished from the customary purification processes in that it does not require the handling of bulky masses, either pulverulent or liquid. Furthermore, on considering the high reaction velocity of the desulphurization process, it will be at once apparent that the ground space required for setting up the apparatus and the amount of power required are both small. From the purely chemical point of view, the procedure is just as simple as the bog iron-ore process, thereby rendering all permanent scientific control superfluous. Therefore, with regard to cost both of installation and of operation, the economic balance of the process shows a distinct progress over the older gas purification process."

The oxidation of phosphine and thereby the purification of acetylene, ammonia, etc., may be effected by passing the gas with oxygen or air over activated carbon (39-40). The phosphorus acid formed is removed by washing with water.

The oxidation of nitric oxide "is accelerated as much as 500-fold in the presence of highly adsorptive forms of carbon" (41-42).

The chlorination of hydrocarbons is advantageously affected by the presence of activated carbon (43).

The reaction of a gas with a liquid (44) may be effectively brought about by allowing the liquid to come in contact with the gas adsorbed by activated carbon or the liquid and the gas may be brought together in the carbon by passing them counter-currently through a column of the granular carbon. The process is said to be applicable in bleaching liquids, in oxidizing drying and semi-drying oils, in the decomposition of or oxdization of mineral oils for the purpose of converting them into fatty acids and other products and in purifying and sterilizing water or other liquid with chlorine.

Activated carbon impregnated with metals, metallic oxides or salts has a wide field of usefulness as a catalyst.

Obtaining High Vacua

In evacuating X-ray tubes, audion bulbs and such, the adsorptive power of activated carbon causes it to be of considerable value. Commercial containers designed for preventing heat transfer to or from the contents may be partly filled with heated activated carbon and roughly evacuated and sealed off. When the carbon cools, it absorbs the remaining gases and produces a high vacuum. The interesting results obtained by Professor Briggs (4) in this connection show that activated charcoals have a very much higher evacuating power than does silica gel or special collodial silica prepared by him.

The fact that excellent gas-adsorbent carbon is now available in quantity will no doubt permit many other commercial applications to be made.

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A Story of Waste Utilization

Insulating Lumber From Sugar Mill Bagasse

From Extracted Sugar Cane Fiber, Now Used Only as Fuel in Order to Get Rid of It, Has Been Developed an Insulating Lumber of Great Commercial Value

By Alan G. Wikoff
Assistant Editor, Chem. & Met.

FOR MANY YEARS bagasse, the fibrous residue obtained from sugar cane-crushing mills, has attracted attention as an interesting waste material which for lack of a better application was being burned under the sugar mills' boilers. Almost without exception the earlier efforts to utilize bagasse failed miserably because they attempted to force the material into service for which it was not adapted.

Today, thousands of tons of bagasse enter into the manufacture of a nationally marketed product, but the story of this development is quite different from that of the earlier endeavors. With a definite objective in view—the production of a building board so full of dead air cells that it would form an efficient insulating lumber—a comprehensive experimental investigation was undertaken for the purpose of determining the type of fiber which would give the desired results. Bagasse was finally chosen as the best material available in quantity.

After further study a plant was built near New Orleans and the product placed on the market under the name of Celotex by the Celotex Co., Conway Bldg., Chicago, Ill. By this time many of our readers have undoubtedly become familiar with this novel material, but it may be of interest to review briefly the method of manufacture as well as some of the properties and applications.

In the first place, methods for collecting and storing the bagasse had to be developed, since the sugar mills operate only 75 to 100 days a year, whereas a 6-day week is maintained throughout the year at the Celotex plant. The bagasse is accepted by the Celotex Co. at the end of the conveyors to the sugar mill boilers. It is then removed by drag conveyor to an area large enough to

FIG. 1—THE PLANT AT MARRERO, LA.

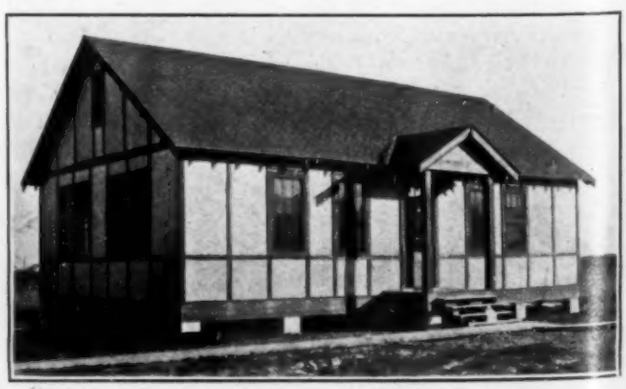


FIG. 2—CELOTEX APPLIED AS EXTERIOR FINISH

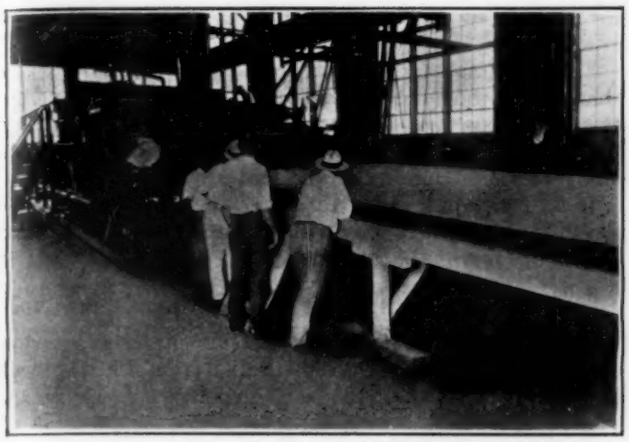


FIG. 3—MACHINE WHICH FORMS CELOTEX BOARD

take care of a baling station. It was necessary to design special balers which are fed through hoppers and deliver bales weighing approximately 200 lb. Two machines will handle the bagasse from a 1,000-ton mill, although more are provided to insure continuous operation.

Bales may be brought directly to the mill or piled 25 to 30 ft. high for storage in a field near the mill, as shown in the headpiece.

The plant, Fig. 1, is located on the old Ames plantation at Marrero, near New Orleans, the site containing 48 acres with 500 ft. frontage on the Mississippi River which is to be developed to handle export shipments and possibly to receive bagasse from Cuba. Railroad connection is provided with the Texas & Pacific and the Southern Pacific.

Manufacturing operations resemble paper mill practice, although, of course, much of the equipment had to be designed specially for the purpose and many unusual problems were encountered. Entering the mill, the bagasse bales are opened and fed by conveyor through a shredder to the cooker, in which the resins, waxes and similar materials are removed, leaving the fibers tough and flexible. As in the case of ordinary paper, fiber separation is obtained by treatment in beaters and refiners. Waterproofing material is added and the pulp pumped to storage tanks. These feed the machine shown in Fig. 3, which felts the fibers into a continuous board 12 ft. wide. It should be noted that the entire board is formed in one operation; it is not built up of separate layers.

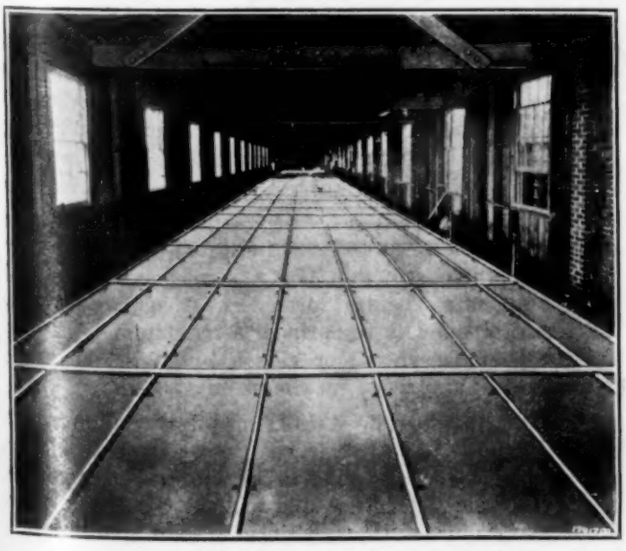


FIG. 4—VIEW ALONG TOP OF 800-FT. DRIER

Passage through the 800-ft. continuous hot air drier, Fig. 4, removes absorbed water, and all that remains is to cut the board by means of cross-cut and rip saws into standard 4-ft. widths, the length varying from 8 to 12 ft. as desired. From 25 to 30 million sq.ft. of board is produced annually by the present plant, and this capacity will be greatly increased by additions now under construction. Two general classes of board are made, a $\frac{7}{16}$-in. building board and a $\frac{5}{16}$-in. box material.

Celotex insulating lumber has an apparent specific gravity of about 0.25 and weighs only 60 lb. per 100 sq.ft. $\frac{7}{16}$ in. thick, so that it contains 80 to 85 per cent voids. Owing to the interweaving and felting of the fibers, a very large proportion of this air space is in the form of dead air cells, which are most efficient heat insulators. In insulating value Celotex is equal to cork, the thermal conductivity determined by the flat plate method being 7.91 B.t.u. per sq.ft. of surface per deg. F. difference in temperature per 24 hours for 1 in. thickness. Bureau of Standards values for other materials expressed in the same unit are: Corkboard (pure), 7.4; rock cork, 8.3; pulp board, 10.4; white pine, 19.

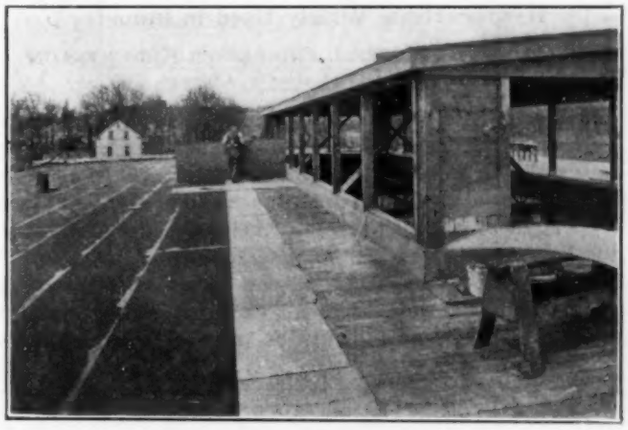


FIG. 5—ROOF INSULATION OVER WOOD DECK

Notwithstanding its light weight, the lumber is very tough and strong, tensile strength averaging 373 lb. per sq.in. As regards transverse strength, board 6 in. wide with supports 12 in. apart showed a deflection of $\frac{1}{8}$ in. under a load of 32 lb., while 158 lb. applied to a 12-in. board with supports 16 in. apart produced a deflection of $\frac{1}{8}$ in. Tested as a sheathing material applied to studs, in comparison with sheathing of $\frac{7}{8}$x6 in. yellow pine, Celotex showed six times as much resistance at the point of initial deflection and nearly twice as much load at the point of failure. Under compression the material merely becomes more compact and does not exhibit any maximum crushing strength. Thus a pressure of 1,800,000 lb. per sq.ft. produces an 80.52 per cent reduction in thickness under load and a permanent reduction after releasing load of 72.90 per cent. Water absorption tests show an absorption of 3 per cent by volume after 4 hours immersion and 12 per cent at the end of 72 hours.

From what has already been said, the method of applying Celotex is self-evident. It can be cut and sawed like lumber, but because of the fact that it is used in larger surface units, the cost of application is much less. While functioning as insulation it may at the same time

serve as sheathing, plaster base, interior or exterior finish. For finish, it may be painted, stained or stuccoed. Fig. 2 is typical of its application as exterior finish for plant offices and similar structures, while Fig. 5 shows its use as roof insulation over a solid wood deck in an industrial building.

Aside from such obvious uses as in refrigerator cars, ice boxes and cold storage warehouses, more general recognition of the value of temperature insulation in building construction would result in a very appreciable conservation of our available fuel supply. It should be more widely known that even moderate insulation will reduce by about 25 per cent the fuel required to heat an average house, while thorough insulation will give a saving of one-third to one-half. Proper insulation will also materially reduce the temperature inside the home in summer and render it cool and comfortable.

Factors Controlling Behavior of Asphalt Mixtures

Physical Properties of Mixtures of Solid and Liquid Hydrocarbons Widely Used in Industry

By Jacque C. Morrell and Lester Kirschbraun
Universal Oil Products Co., Chicago, Ill.

IN EVALUATING the usefulness of asphalts for industrial purposes such as for paving and saturating materials for roofing products, the physical characteristics are the most important. A knowledge of such properties as the penetration, melting point, viscosity, ductility, cementing value and elongation is essential to the proper estimation of the value of bituminous materials. In order to make such materials conform to specification requirements or to serve particular requirements, it is necessary to blend or flux various types with one another.

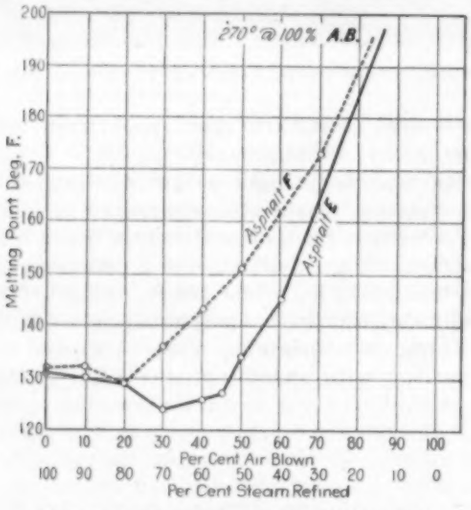


FIG. 1—MELTING POINT CURVES FOR ASPHALT MIXTURES

It is one of the purposes of this short article to point out the various properties of mixtures of steam-refined and air-blown asphalt. The particular purpose, however, is to indicate the possibilities of a study of such systems from a physicochemical viewpoint. In the latter respect no claims are made as to completeness of study here.

The chief methods of investigating systems such as that under consideration from a viewpoint of the physical condition are the thermal and microscopic. The latter is, of course, important from a viewpoint of a study of the structure of the materials.

In asphalts or asphalt mixtures the melting points—that is, the passage from the solid to the liquid state—does not exhibit a break, but is continuous. This is a different state of affairs, therefore, than in a study of systems which crystallize sharply.

The melting points of the systems under discussion lie on two curves sloping downward from 100 per cent respectively of each of the two components (see Fig. 1). The point of intersection represents the composition of the mixture which has the lowest melting point of any of the whole series. This corresponds to what is ordinarily termed the eutectic point. At this point if the solution of one asphalt in the other acted as metal alloy they would be saturated with respect to each other.

Of the many pairs of relative proportions of the two asphalts, "E" and "F," this proportion has a freezing point lower than that of any proportion of the series. The eutectic is really a conglomeration of the two components, as can be readily determined by microscopic examination, especially when applied to salt solutions, fused salts, igneous rocks and fused combinations of other substances.

Phase-Rule Considerations

If the system under consideration could be looked upon as being composed of two components we may apply the phase rule, $f = n - p + 2$, where f indicates the degrees of freedom, that is, the number of variables, namely, temperature, pressure and concentration, n the number of components and p the number of phases. As with systems of metals, pressure may be omitted from the variables to be considered, and for all practical purposes the vapor phase may be neglected. This would reduce the formula to $f' = n - p + 1$, which is the form which is used mainly in the consideration of alloys.

When the system is in the liquid state, there are two degrees of freedom—namely, temperature and concentration—which may vary indefinitely without any alteration of the number of phases up to the point at which vaporization takes place. At the eutectic point, if such exists, the two solids are simultaneously in equilibrium with the liquid. There are three phases present, and the number of degrees of freedom are therefore reduced to zero, having a definite temperature, the eutectic temperature and eutectic concentration. The system is then said to be invariant.

Compound Formation.—The fact that intermetallic compounds have been isolated indicates that there may be a possibility although not a strong probability of such compounds being formed in asphalt systems. When a compound is so formed, a maximum is usually indicated on the curve, or else a break in the curve indicating a suppressed maximum may occur.

Solid Solutions.—The state of mutual solubility which exists in the liquid phase may also be present to some extent in the solid state. A solid solution is, therefore, a single phase. It is possible to have a eutectic form from two solid solutions. Since a solid solution is a

single phase and the only other phase present is the liquid phase, neglecting the vapor phase, of course, we therefore have one degree of freedom in such a system.

The three types of systems which comprise solid solution are those in which the freezing point curve lies wholly between the freezing point of the two components, those which exhibit a maximum, and lastly, those which exhibit a minimum. The solid in the systems which separates out, where this is possible, is in equilibrium with the liquid, so that to define the system completely two curves are necessary. The solidus curve may be regarded as the melting point curve and the liquidus curve as the freezing point curve.

Where the curve exhibits a minimum we have the characteristics of the curve for a eutectic system, although in reality the curve in the case of a solid solution is continuous.

In order definitely to establish whether such a system is a solid solution or a eutectic, it would be necessary to make a microscopic examination to confirm the presence of the characteristic eutectic structure. The pattern produced by the intergrowth of two such phases is much varied, but is usually easily detected in the case of alloys and slags or rocks. With asphalts, however, no work has as yet been done with regard to etching agents or the development of structure.

With regard to the latter it would be interesting to try out other methods of bringing the structure into relief—for example, the use of various finely divided powders of varying colors which would adhere in differing degrees to the two phases, or powders of different colors adhering preferentially to the several phases.

The graphs on the other important physical properties of mixtures of steam-refined and air-blown asphalt are shown in Figs. 2 and 3. The data are presented in Table I.

TABLE I—DATA ON PHYSICAL PROPERTIES OF ASPHALT MIXTURES

Per Cent of Flux	Penetration	Melting Point Deg. F.	Ductility At 77 Deg. F.	Cementing Value At 5 Deg. C.	Elongation At 5 Deg. C
		Asphalt "E"			
0 Steam-Refined	30	131	115 cm.	.....	....
10	34	130	115 cm.	0.489	7.0 cm.
20	49	129	115	0.363	9.0
30	65	124	115	0.178	11.5
40	73	126	115	0.150	8.5
45	77	127	115	.....	....
50	67	134	57.5	0.116	6.0
60	60	145	12.5	0.078	3.5
100 Air-Blown	37	270	1.5	0.059	1.5
		Asphalt "F"			
0 Steam-Refined	30	132	115 cm.	.....	....
10	35	132	115	0.360	7.0
20	44	129	115	0.241	6.0
30	54	136	78	0.185	5.25
40	56	143	19.5	0.142	4.2
50	57	151	9.5	0.112	3.5
70	50	173	4.25	0.083	2.5
100 Air-Blown	37	270	1.5	0.059	1.5

A study of the preceding curves would show a maximum in both cases for the penetration. The elongation in the case of asphalt mixture "E" shows a maximum which does not appear in asphalt mixture "F." This is due to the fact that the decreasing penetration induces an element of brittleness at the temperatures and under the rates of elongation employed, thus preventing the full development of elongation which would otherwise be presented as a smooth curve. The type of curves for the cementing value and ductility is the same in both cases, and shows nothing of unusual interest.

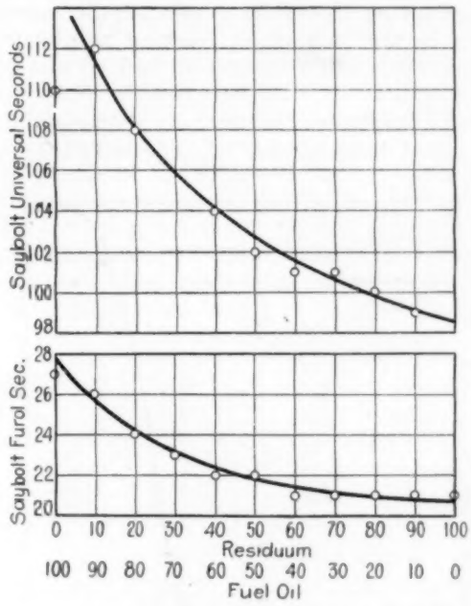
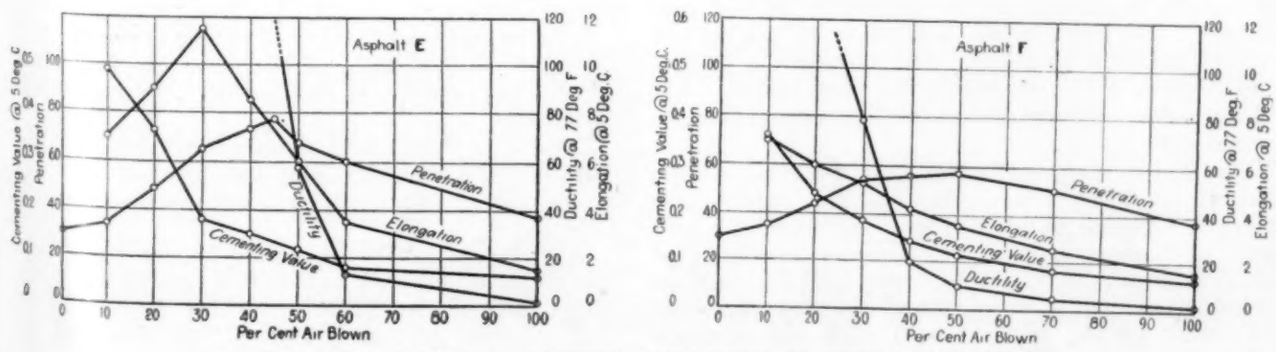


FIG. 4—VISCOSITY RELATIONS OF FUEL OIL—CRACKED RESIDUM MIXTURES

In order to apply the above method of study to liquid mixtures some experiments were carried out on mixtures of fuel oil and cracked residuum from the same. A 26 deg. Bé. fuel oil containing very little paraffine was selected as an example. The chief properties of fuel oil of interest from the present viewpoint are the viscosity and the cold test or congealing temperature. No breaks in the curve were exhibited in the case of the viscosity, as can be seen from the curves in Fig. 4. This conclusion was checked against several different types of oil. The curves shown are for 77 deg. F. in



FIGS. 2 AND 3—PRINCIPAL PHYSICAL PROPERTIES OF ASPHALT MIXTURES

the case of the Saybolt Furol viscosity, and for 100 deg. F. for the Universal Saybolt viscosity.

Regarding the cold test the following may be given as an example:

Per cent of Original Fuel Oil	0	10	20	30	40	50	60	70	80	90	100
Per Cent of Cracked Residuum	100	90	80	70	60	50	40	30	20	10	0
Degrees F.	−28	−32	−30	−28	−22	−18	−2	+30	+41	+50	+48

These figures indicate an important economic aspect of such mixtures in bringing about a reduction in the congealing temperature of fuel oil as such, thereby facilitating handling and transportation.

Fig. 5, showing these data graphically, brings out the similarity in the melting or freezing point curves of asphalt mixtures and mixtures of fuel oil and cracked residuum.

It is to be pointed out particularly that such mixtures as are shown here cannot be represented by simple

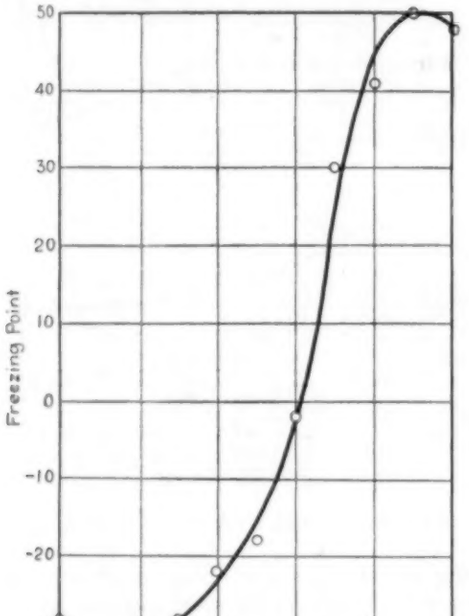


FIG. 5—FREEZING POINT RELATIONS OF FUEL OIL—CRACKED RESIDUUM MIXTURES

functions—i.e., the physical properties cannot always be directly deduced from the properties of the components. For example, the addition of 30 per cent of cracked residuum to original fuel oil caused a drop of only 18 deg. F. in the congealing temperature, while 40 per cent residuum decreased the congealing temperature 50 deg. F.

The field of systematic study along the lines of solid and liquid hydrocarbon mixtures has barely been touched, although in practice such mixtures have been used to a great extent. Fundamental knowledge of physical properties is the first requisite for such an investigation. It is hoped, therefore, that this study will point out the value of such work and stimulate efforts along these lines.

Effect of Silicon and Manganese on Aluminum Alloys

The standard aluminum alloy for general casting purposes has generally been considered as one containing about 8 per cent copper and 92 per cent aluminum.

Alloys of aluminum containing 3 to 5 per cent of silicon in combination with copper within the same limits are suitable for the same general casting purpose as the standard aluminum-copper alloy. The fundamental value of the alloys containing silicon and their advantage over the standard alloy lie in their relative freedom from casting defects, such as cracks, due to solidification shrinkage, hot shortness, draws and porosity. The alloy of 3 per cent copper and 4 per cent silicon gives a tensile strength of 21,000 lb. per square inch and an elongation of 2.5 per cent in the "as cast" condition, falling off about 800 lb. in tensile strength after being machined, due to the removal of the "skin." The aging effect on this series of alloys is negligible. The pattern shrinkage of the whole series is less than that of standard aluminum-copper alloy.

The addition of 1 per cent of manganese slightly raises the strength at high temperatures but impairs the casting qualities. Its use in the copper-silicon-aluminum alloys is therefore not to be recommended.

The mechanical properties of the copper-silicon-aluminum alloys are about the same as those of the standard copper-aluminum alloy. The ductility is slightly better and the solidification shrinkage and specific gravity slightly less. The best alloys of the copper-silicon-aluminum series would be those with copper content corresponding to the upper limits and silicon to the lower limits of the composition first mentioned.

Tanning Industry Obtains New Source of Mangrove in Mexico

The construction of the canal through the Coyuca and San Jeronimo lagoons to the northwest of Acapulco, Mexico, is bringing to light products available for exportation, notably an almost inexhaustible supply of mangrove, says Consul G. A. Bucklin in a report to the Department of Commerce. The bark of this tree is well known in the tanning industry.

There are two varieties of the mangrove, known locally as the white and the brown, according to the interior color of the bark. They seem equally good for tanning purposes. The natives also use the brown variety for staining fishing lines and nets, the reddish brown color being considered attractive to fish. They also stain shirts made of the locally manufactured unbleached muslin, so as to render them less conspicuous when hunting.

One firm estimates that it will be able to procure from 50 to 100 tons monthly of the mangrove for export. Cheap native labor will also enable it to make prices reasonable.

There is an export duty on mangrove as on other tanning materials, this duty being 1 centavo per kilo. This is equivalent to $5 U. S. currency per metric ton of 2,204 lb.

In so far as can be verified in Mexico, the freight rate on mangrove bark to a Pacific port in the United States, such as San Francisco or Los Angeles, is $16 U. S. currency per ton of 2,000 lb. To New York, via the Panama Canal, the rate is $26.

Some Problems Encountered in

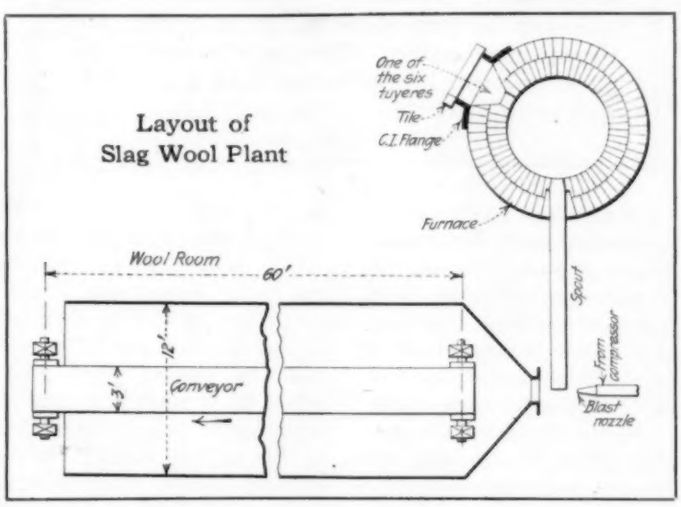
Designing and Operating a Slag Wool Plant

Utilization of the Waste Material From Any Industry Is a Profitable Field for Research—In This Article, a Metallurgist Discusses the Manufacture, in the Vicinity of San Francisco, of an Insulating and Filtering Material From Smelter Slag

By Herbert Lang
Metallurgist, Berkeley, Calif.

SLAG WOOL, called also mineral wool, rock wool or silicate cotton, is a furnace product which has been made and sold for at least 50 years as a non-conductor of heat and sound. The writer, who has been interested for many years in the utilization of furnace slags, is at present engaged in the manufacture of this material on a commercial scale and it is the purpose of this article to discuss briefly some of the problems encountered.

The manufacturing operations are comparatively simple, as may be gathered from a study of the plant layout. It is necessary only to blow air or steam across and through a stream of slag as it falls from the spout of a furnace. The liquid is broken up into a multitude of minute droplets, each smaller than the head of a pin and each of which as it courses through the air leaves behind it a thin thread of wool which slowly settles.



Why does the droplet spin a thread? One would suppose it might shed miscellaneous and formless fragments as it passes, comet-like, through the air. It is possible that the tail is the result of skin friction, the air holding the molten pellet back and stripping off its outer layer. Sometimes the pellet is entirely converted into a single fiber of extraordinary thinness, the length of which may reach many feet. Sometimes the flight results in a thread with a head attached; sometimes only pellets are formed without a thread; these drop into the wool, and go by the name of "shot." How to get rid of shot is a problem. The best way is to make none; but this is easier said than done. The writer thought to have solved the question thus but found that immunity from shot was due to factors such as the composition of charge and the force of air, which could not be reproduced at will. Discarding the shot after formation proved more successful.

The blowing operation is wasteful of power; the energy spent in blowing wool is sufficient to raise the slag through a vertical distance of 12 miles. It is evidently used up by friction in the nozzle, by setting up conflicting air currents, and by actual work done on the slag. It would be gratifying if someone would discuss the factors of surface tension and kinetic energy. The best I have been able to do in lessening the consumption of power is to design a better form of nozzle than those customarily used.

The interior of the darkened room where the wool is formed presents an interesting sight. Millions of little pellets, each white hot and traversing its own trajectory, combine in a sheaf of fire, giving a display of energy seemingly out of all proportion to the means that gave it birth. The average length of flight of the pellets, so long as they remain incandescent, seems to be about 10 ft., but they may travel a much greater distance after being extinguished, although they probably cease to spin a thread when cooled below redness. It is curious that they remain red hot at all, considering the refrigerating influence of the blast which strikes and forms them. The air, at 75 lb. per square inch—a pressure I have found the most desirable—when discharged into the atmosphere, falls to a temperature below zero. Assuming that the temperature of the slag is 2,000 deg. F., that 1½ tons of compressed air is needed to blow 1 ton of wool, that the temperature of the air at the moment of expansion is 275 deg. (compressor being run with about 0.4 cooling), and that the specific heats of air and slag at this temperature are approximately equal, the temperature of the air-slag system should be about 630 deg. F., which is far below redness. Besides, there is the cooling influence of the large volume of entrained air, so that *a priori* one might expect to get no wool. However, it falls abundantly.

Slags Must Be Selected for Wool-Making

All slags will not make wool. A slag too rich in iron will blow into shot, without a trace of wool; slags too rich in the alkaline earths blow into short wool and even into dust. To make the long-fibered wool, a slag is required that has a prolonged period of plasticity (or viscosity); there must be a wide range of temperature between softening and complete fusion. This phenomenon is best exhibited by glass, in which the range between appreciable viscosity and fluidity is not less

than 1,000 deg. There is no example known to me of a furnace slag which possesses such a range of viscosity; but many exhibit the quality in a limited way, the more acid slags being the more viscous and apt to remain longer unsolidified in the pot. On the other hand the basic slags chill quicker and have the shortest range of viscidity.

A tradition of the slag-wool industry demands a white or light-colored product, which requires that the slag shall be almost or quite devoid of iron; to obtain this, the manufacturer must use as bases the alkaline earths and alumina; these combinations are difficult to fuse, requiring much fuel. Considering that the wool is usually placed in partitions and other places screened from sight, it follows that the question of color is of no moment. The wool may be black, so far as its usefulness is concerned. Another firmly fixed belief was that all slag wool contained an injurious amount of sulphur, leading to ready decomposition, and the injury of the steam pipes on which it was used as an insulator. The evidence was exaggerated. This objection probably arose from the fact that at the commencement of manufacture, the slags used were those produced in the iron industry, the making of specially calculated slag not being undertaken until long after. The slag of iron furnaces, of course, runs high in lime, and absorbs a great deal of the sulphur in ore and fuel. When basic, as is often the case, it contains much calcium sulphide, which is an unstable compound, easily decomposed by air and moisture. Iron-furnace slag when tapped into water emits a strong odor of hydrogen sulphide. It is not surprising, therefore, that wool made of such material should lack permanency under the influence of moist air, nor that users of it should object. The difficulty arises in large part from the improper composition of the slag. It was not until manufacturers advanced to the conception of specially made slags that success was achieved in the art, and a durable wool produced. No slag rich in lime or magnesia, and below a certain content in silica, can be looked upon as a suitable source of slag wool, although acid mixtures might succeed if their fusing points were not too high. The most durable and permanent slags are those of intermediate acidity produced when smelting copper, and particularly in pyritic smelting; these are suitable for making wool; they produce the softest and longest fibers, and contain only a small amount of sulphur. The period of plasticity may be shortened by the iron, but it persists long enough to insure a long and extremely attenuated fiber. The silica in the best samples is not much above 40 per cent. In this respect I am unable to reconcile observed fact with theory as to the superior plasticity of highly siliceous slags; there is a good deal to learn about slags. It is fortunate that good wool can be made from ferruginous slags the melting point of which is low enough to allow the use of ordinary fusion apparatus. The writer was at first under the impression that good wool could only come from acid slag, which would require the use of extraordinary means for fusion, such as electric or regenerative furnaces.

Why is it inadvisable to attempt to manufacture slag wool directly from the smelting furnace? What characteristics of the slag have a determining influence upon the quality of the wool? In what type of furnace should the slag be melted to insure uniform, continuous production? These are typical of the questions which are answered in a practical way in this article.

It has been noted that the pioneer manufacturers of wool used, or attempted to use, the slag from furnaces, especially those making iron; it seems that they met with great difficulty. This is not at all surprising, for the management of a modern plant of this kind is no sinecure, and it is difficult to imagine the manufacture of wool under the conditions prevailing at iron or copper smelting works. A steady stream of slag of the correct composition and temperature, which does not vary in volume from hour to hour or day to day, is essential. Too large a stream cannot be handled by the air jet; it will be scattered, giving only a small amount of wool, of inferior quality. Too slender a stream, on the other hand, will produce short wool and small pellets. The temperature must be under control. If the slag be too cool, the wool will be harsh, brittle and glassy; if too hot, it will be short. There is no possibility of making good wool from the slag flowing from a furnace devoted primarily to other purposes. This has been the experience of numerous operators who have tried in a small way to make slag wool experimentally at their own copper, lead and iron-smelting plants. Every successful wool plant must have its own furnace.

Various types of melting furnaces have been used at wool plants—the reverberatory, the cupola and the electric. The firm with which the writer is connected first built a reverberatory, then a tilting furnace such as used in melting brass and other alloys. Neither was successful; the slag segregated in the hearth of the reverberatory, and waves were set up whenever the fresh charge was introduced, interfering with the continuity of flow from the spout. The output from the tilting furnace was too small. Wool was made in small quantity, and of great diversity in character. When called in to design a new furnace, the writer had an opportunity to analyze various samples and found that, so far as the quality of the wool was concerned, an ordinary copper slag answered as well as any, for the melting of which a common cupola was suitable. But an ordinary cupola blown with a blast would not answer; the blast has to be trapped and it was impossible to make the trapped blast work on a furnace of such small size (25 tons a day). It was necessary, therefore, to drive the furnace by suction instead of blast, thereby obviating the difficulties connected with the tap hole. It will be realized that, on account of the disturbance to the slag stream, the gases cannot be allowed to issue from the tap hole with the slag; furthermore, men work there. The principal advantage of the suction furnace is the even and placid flow of slag, the operators continuing for several days without the hole being touched with the bar.

The furnace now in use is built of firebrick, without water-cooling; it burns crude petroleum oil and the briquets of so-called lampblack, made from the residuum of the gas works. Oil burners are fixed in each of the six tuyeres, as well as in the tap hole; these deliver a jet of flame into the interior of the shaft, where the combustion is completed and smelting temperature reached. The furnace works peculiarly; each

jet first burns a cavity, which enlarges and joins the others, until the crucible is emptied, and a chamber, filled with flame, results, overarched, at the height of one foot or so above the tuyeres, by the melting charge. This peculiar condition is not prejudicial to rapid running or to the regular progress of the work. The slag, raining down from above, falls into the lakelet below and finds an exit through the tap hole, which is about 4 in. in diameter. The tuyeres were originally about the same size; but they diminish and enlarge according to circumstances, sometimes reaching 8 or 10 in., only to fill up again when the oil of that particular jet is turned off; this seems to make little difference to the rate of smelting. Occasionally, loose stuff caves down upon the hearth, where it melts as in a reverberatory. To operate a brick furnace requires skill; and, considering the class of labor available, the writer is inclined to think that the water-jacketed ones are to be preferred, even on a small stack. The suction furnace is more easily kept in repair, especially about the tuyeres, where the lining is accessible.

Fuel Consumption 8 Per Cent of Oil Per Ton

The furnace described is closed at the top and is provided with the familiar bell-and-hopper device for feeding. The draft is produced by two exhaust fans working in tandem; that is to say, one blows through the other. Combined, they give an inward draft of about 10 or 12 oz. per sq.in., which is sufficient for the purpose. Three or four more fans could be arranged in this way, so as to give more draft. The slag stream is steady; but the novelties of oil-burning and inward draft made the operation difficult. The suction feature makes it convenient to burn oil; the tuyere covers can be removed and the burners regulated without annoyance from the escape of wind, but there is loss of heat by radiation. It requires, when oil is used alone, about ½ bbl. fuel oil per ton of charge; but it has been the habit at times to feed some briquets, which are an excellent smelting fuel, but more costly than oil used alone. As nearly as can be determined, it takes 8 per cent of oil or 11 per cent of briquets per ton to melt the charge.

It would be possible to combine copper matting with slag wool making in the single furnace if suitable ores were available. As before stated, the wool-making slag is in many respects similar to pyritic slag, but I usually endeavor to keep it more acid on account of the furnace lining; this, of highly siliceous brick, is affected considerably by basic slags. Chrome brick may be used instead of ordinary firebrick, and the use of water jackets will reduce the corrosion, but there is no serious difficulty with a firebrick lining; it may be cheaply and easily replaced; it lasts about one month.

Insulating Value Depends Upon Dead Air Cells

Slag, *per se*, is a poor insulating material. It is a type of glass, and transmits heat with considerable facility; in the form of wool, however, it is a good nonconductor. Its value depends upon the amount of air entangled, air being the great insulating substance. The fact that slag possesses little insulating power is of small moment when we consider the almost infinitesimal amount of it contained in a mass of wool. When the wool is first formed in the blowing chamber, 1 cu.ft. will weigh no more than 2 or 3 oz. The slag of which it is composed weighs nearly 200 lb. per cubic foot, so that the solid matter in 1 cu.ft. of wool forms not more than one-thousandth part of the mass, the remaining 999 parts being air. It is essential that there shall be sufficient fiber to prevent movement of the air, lest convection currents be set up, assisting the passage of the heat. But if the fibers be too numerous, they will afford passage by their points of contact. It is found, as might be anticipated, that if the wool be compressed beyond a certain point its insulating power is lessened. This is true of all insulators without exception. They should therefore be used loose, as loose as possible. It will be seen that the introduction of a binding material must diminish the efficiency by eliminating air and substituting a vastly inferior insulating material. Insulators in powdered form are inferior to fibrous ones in their capacity to prevent the passage of heat or sound; though by virtue of increased solidity they may be formed into shapes. Anything that reduces the porosity of the insulator diminishes its efficiency; hence the impropriety of introducing a binder which, however useful it may be to sustain the mass and enable it to be molded into a variety of desirable forms, reduces its insulating power. The compression of the mass furnishes additional points of contact between the particles and assists the passage of heat (or sound). In many instances, however, one cannot employ a fragile insulator such as asbestos, mineral wool or animal or vegetable fiber. Such materials are suitable for use in situations where the insulating body is out of sight and protected by metallic or wooden covering.

Slag Wool Not Self-Binding

Mineral wool, unlike sheep's wool and some organic fibers, cannot be felted, owing to its physical constitution. It is composed wholly of smooth rods, which lack projections to hold them together; although the mat of innumerable interlaced members holds together. In order to form a coherent sheet it has to be reinforced, either with a sizing material, or by covering both sides with paper or cloth. In either case, the fabric loses its highly valuable character of indestructibility. This lack of self-binding power has also led manufacturers to substitute something in the way of an interior binder, generally to secure flexibility to the sheet; but the fibers are generally too brittle to make the fabric worth while. Experiment may yet evolve a mineral wool that possesses toughness and flexibility.

The capacity of a body to conduct the heat is the converse of the body's power to prevent its passage—its insulating power. Findings of observers are discordant, but we may derive the following approximate statement of the relative insulating power of bodies:

Air, and other common gases	20,000
Mineral wool, long fiber asbestos and elderdown	10,000
Sheep's wool	8,300
Wood, average of many varieties	2,000
Water	500
Stone, average of many varieties	200
Iron and steel	5
Copper	1

Slag wool has a wide range of usefulness, as a scrutiny of the following list of its applications will show. It is used for covering steam and hot-water boilers and pipes, and the walls and pipes in refrigerators; as the lining in fireless cookers and refrigerator cars; as a sound deadener in the floors and walls of houses; as steam packing; as a filter for various liquids; as a constituent of polishing wheels; as lining between the planking and metal sheathing of ships; for printers' blankets; for covering oil tanks, pipes and retorts; as a roof covering, mixed with asphalt or tar.

Hints That Cut Cost. Management Puzzles

The Plant Notebook

An Exchange for Operating Men

Practical Problems of Plant Operation

Eliminating Stench

By W. V. Watson
Chemist, San Diego Consolidated Gas & Electric Co., San Diego, Calif.

In almost inaccessible parts of our big gas holder pigeons have nested for years, their droppings causing an acid condition of the seal holder water. Oxidation of plates was so heavy that lime was added to counteract the corrosive condition. The effect has been a very unpleasant odor on the windward side of the holder, caused by the liberation of ammonia by the lime.

An addition of 0.1 per cent bicarbonate of soda, forming ammonium carbonate, has effectively sweetened the atmosphere.

I wonder if there are other holders or tanks thus afflicted, and if so, what has been done to remedy the trouble.

Preventing Segregation of Fines in Bin Discharge

Where various substances or the same substance of various mesh sizes are blended and stored in steel bins (or bottles, as they are sometimes called), trouble often results because of the segregation of coarse from fine when the gate is opened, and the "piping" of the material down the center. To prevent this, one industrial company carried out extensive investigations, which demonstrated that, with the mixed material being handled, a certain definite ratio of height to width must be maintained to obviate coring. The height was necessary, apparently, to insure pressure and consequently movement of the material that otherwise remained against the sides of the cone at the bottom of the bottle.

It is not always practicable to design tall storage bottles of precise dimensions; further, conditions vary as part of the contents is withdrawn. By fitting a circular baffle (sometimes miscalled a diaphragm) near the exit, as shown in the accompanying cut, "piping" may usually be prevented. A small cone of "dead' material will remain above the baffle, but no segregation will occur. The space between the baffle and the sides of the cone should slightly exceed the area of the outlet.

BAFFLE PLATE TO PREVENT SEPARATION OF FINES

Salt Resistance Thermostat

By Paul E. Demmler
Westinghouse Chemical and Experimental Laboratory

The salt resistance thermostat was developed for the particular purpose of automatically controlling the temperature of electrically heated solder pots, but it has a wider application and may readily be adapted for use in many other places. In considering methods of control for temperatures between 400 and 500 deg. C. (752-932 deg. F.), those depending on the thermo-electric pyrometer were the only ones found to be satisfactory. However, this method is very expensive, especially where a large number of pots are in operation, each requiring separate control. The cost of the salt resistance thermostat is comparatively low; it holds the temperature constant within close limits; it is strong mechanically, all of which features are desirable in a thermostat for solder pots.

The operation of the salt resistance thermostat is based upon the fact that salts, as well as oxides and non-metallic materials in general, have a negative temperature coefficient of electrical resistance, the resistance decreasing very rapidly as the temperature approaches the melting point of the material. Above the melting point, further decrease is slight. In many cases, salts change from high resistance materials, having a resistivity of 1,000 to 5,000 ohms per centimeter cube, to fairly good conductors, having a resistivity of 1 to 5 ohms per centimeter cube, as the temperature is varied 10 to 15 deg. C. (18 to 27 deg. F.) at or near the melting point of the salt. The reverse change takes place on cooling. This change in resistance is constant over long periods of time under conditions of alternate heating and cooling, such as those to which thermostats would be subjected. The changes in resistance of salts when used in a cell in series with a relay may be used to operate a suitable switch for controlling the heating current of an electrically heated solder pot.

The essential parts of the salt resistance thermostat are: 1. A salt resistance cell (a steel tube is satisfactory). 2. A relay. 3. A small transformer of the "bell ringing" type. 4. A switch for controlling the heating circuit.

Operation—Supposing the salt resistance cell to contain a salt whose melting point is about 400 deg. C. (752 deg. F.). In the morning when the heating current is turned on, the pot is cold and the salt has a high resistance. As the temperature of the solder rises, the resistance of the salt immersed in the solder becomes less, but will not be low enough to allow sufficient current to pass to operate the relay until the temperature is approximately 400 deg. C. When this point is reached, the current passing is sufficient to trip the relay, which in turn operates the switch, cutting off the heating current. Current continues to flow through the salt and relay until the temperature of the solder has

dropped and the resistance of the salt has increased so much that very little current passes and the relay returns to its original position. This in turn throws in the switch, turning on the heating current, this cycle of alternate heating and cooling repeating itself as long as the pot is in use.

Although designed for the control of electrically heated pots, this type of control apparatus may be used with gas- or oil-fired equipment, in which case a magnetically operated valve for regulating the fuel supply replaces the switch.

The salt resistance thermostat has been used on solder and babbitt pots, aluminum-melting pots and oil-tempering baths. Pyrometer readings show that it is possible to hold the temperature constant to within ± 3 to 5 deg. C. at 500 deg C. when the pot is not being worked.

Following Up Motor Car Lubrication

By Keene Richards
Industrial Engineer, Grennan Cake Corp., Detroit, Mich.

We have a number of motor trucks scattered about various cities and endeavor to keep in touch with their operating condition through our engineering department.

Among other things, lubrication is very carefully supervised. Each year we sign a contract for our oil requirements based upon laboratory analysis of oil submitted, our past experience and the reputation of the oil manufacturer.

From time to time we get complaints from our various plants regarding motor car lubrication. We find that these can be run down and the solution found by requiring each complaint to be accompanied by a sample of lubricating oil drawn from stock in use and a sample drawn from the crankcase of the engine which is giving trouble. These two samples give us a lot of information as to whether the oil is coming up to requirements, whether the crankcases are being drained often enough and whether the engine trouble is actually due to deficient lubrication or whether it is due to improper inspection in maintenance.

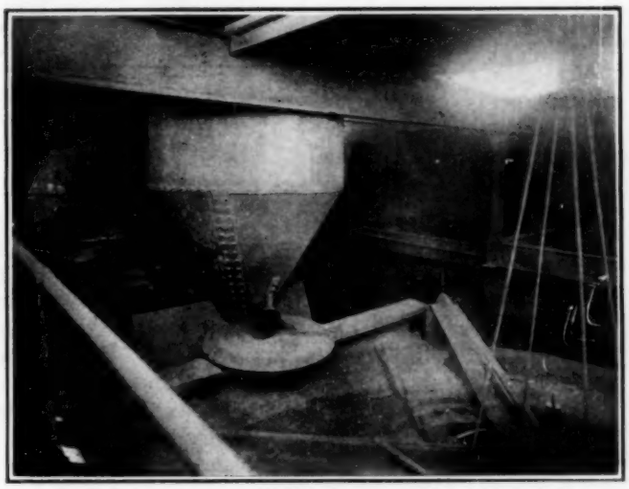
A similar scheme is used in connection with the lubrication of electric motors; their lubrication is carefully supervised through a monthly inspection card which is made out for each motor showing that inspection of oil rings, air gap connections, fuses, starting equipment, etc., has been properly made.

We find it quite important to follow up the proper use of any raw material which is being purchased on specification and contract.

Ore Burner Feed

By J. R. Mecredy
Davison Chemical Co.

The problem of burner feed in sulphuric acid plants has undoubtedly been solved many times. Herewith is, however, both a photograph and a description of the method of burner feed that was worked out satisfactorily at the Davison Chemical Co It is used on both the Wedge and the Herreshof installations.



APPARATUS USED FOR FEEDING BURNERS WITH ORE AT A DEFINITE SPEED

The hopper discharges onto the flat plate, which rotates.

You will note from the photograph a cone bottom hopper apparently discharges on to a disk. This is actually what happens. The hopper is fed from above by means of dump buckets carried on the monorail system which was described in this magazine in the issue of July 30, 1923. Below the hopper is set a disk at a height that is adjustable. It is moved around by the arms on the dry bed on top of the burner, each arm moving it one-quarter turn. As the disk is moved the ore flows out on it and is then scraped off by a stationary iron scraper placed just above the disk.

By regulating the distance between the disk and the hopper mouth the height of the pile of ore on the disk is controlled. This permits the operator to vary the tonnage burned in a given day. After the ore is scraped off the disk it is moved in toward the center of the burner top to the feed lute, from which it drops into the burner proper.

Drift Forces in Solid Piles

In many quarters it is a rather widely recognized phenomenon that a pile of solid material develops terrific stresses and strains. For want of a better title this force has been called the "drift" of solids in piles. It is substantially a drift, because there is a definite displacement of material. Some recent photographs taken of 12-in. steel I-beams in an acid phosphate pile showed a tremendous distortion due to this force, the beams being bowed about 18 in. out of the perpendicular. It was found necessary to reinforce these steel beams with concrete and give the whole a rigidity it otherwise would not have had.

These facts have a distinct interest to all fertilizer manufacturers, because the storage of acid phosphate is always in large piles, and inasmuch as the material is not corrosive to steel, the piles were often built up around steel uprights. This has not been true of saltcake piles, because of a more definite corrosive action of this material. On the other hand, the observation has a wide interest to chemical manufacturers, who must take into account this force.

Machinery and Appliances for Production and Control

Equipment News

From Maker and User

Materials and Accessories for Chemical Industries

A Variable Delivery Pump for Hydraulic Purposes

The Oilgear Company of Milwaukee has recently perfected a very compact variable delivery pump known as the Oilgear Type W. This pump is designed especially for hydraulic presses and similar service. It has a maximum capacity of 3,060 cubic inches per minute. The maximum working pressure is 1,000 lb. per square inch.

According to the manufacturer, the flow of oil is steady and free from pulsations. The amount of oil delivered to the press cylinder is controlled by means of a single handle or lever attached to the stroke-changing mechanism through a hydraulically operated control cylinder. The pump responds instantly and smoothly to the operation of the control handle. This instantaneous response applies both to varying the amount of oil delivered and to reversing the direction of delivery.

The design and construction of the essential parts of this new pump are similar to those of the Oilgear type QC control pump. These parts include the revolving driver carrying the cross heads and plungers, the cylinder barrel and plungers, the ground ported pintle upon which the cylinder barrel rotates, and the swinging arm by means of which the revolving barrel may be shifted relative to the driver in order to regulate the length of the pump stroke. The assembly of the plungers and cross-heads differs from that in the type QC in that the plungers are closely coupled to the cross heads. This provides a suction action that makes it unnecessary to depend on a large auxiliary gear pump. The Type-W is equipped with a small gear pump to keep the running parts well lubricated and to operate the control cylinder.

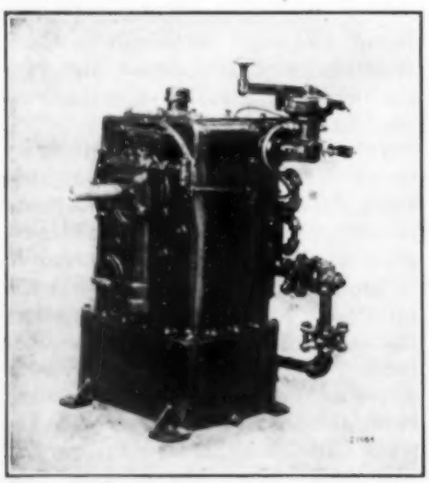


FIG. 1—OILGEAR TYPE-W PUMP FOR HYDRAULIC PRESS SERVICE

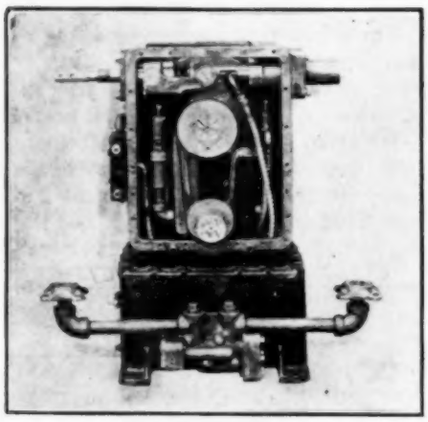


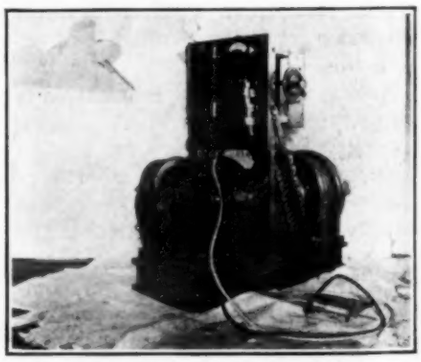
FIG. 2—VIEW SHOWING INTERIOR MECHANISM OF OILGEAR TYPE-W PUMP

The hydraulic control for regulating the stroke of the main pump consists of a double-acting hydraulic cylinder and a piston which is attached to the stroke-changing arm by a cross-yoke and two links. These are so arranged that a heavy spring holds the pins at all times against one side of their bearings in the links, cross-yoke and arm, thereby preventing any play in the joints. Oil pressure to the control cylinder is regulated by a small balanced piston valve that admits oil to one end of the cylinder and at the same time allows it to flow from the opposite end. This construction provides a hydraulic dashpot which holds the arm rigid in any position.

The oil is delivered from the ports through the passages in the main pintle down through one of the two passages provided in the casting which forms the arm on which the pump unit rotates. When oil is flowing down through one passage it is being drawn up through the other. The direction of flow of oil in these passages depends on the direction of flow of oil from the pump. The oil passages in the arm communicate with suitable passages in the lower pintle and these in turn with the delivery and intake pipes. An automatic two-way valve insures the proper direction of flow of oil to and from the sump.

Plastic-Arc Welder

The Wilson Welder & Metals Co. has recently released a new type of electric arc welding machine, one-arc capacity and rated at 200 amperes continuous welding, called the Wilson Plastic-Arc welder. The principal feature of this unit is the new type "J" control panel, which is comparatively simple and rugged and offers extremely close control of the welding current at the arc. Its chief function is to provide constant temperature in the weld and the entire unit is small, compact and connected up ready for immediate operation.



WILSON PLASTIC-ARC WELDER

What to Look For in Rubber Conveyor Belts

BY ANTON M. OLIVER
Goodyear Tire & Rubber Co.

Almost everyone who has to do with belt conveyors is familiar, to some extent, with the so-called rubber belt. This type of belting has been in use for many years. It is this supposed familiarity with the

subject that prompts this article. The condition of the orders for belting as they are received by the manufacturer are living proof that the knowledge of rubber belting is, in the majority of cases, most elementary. We want to present here some of the points on rubber belting that are past the elementary stage of knowledge. A rubber belt, as everyone knows, consists of three parts—the plies, the "friction" (that holds the plies together) and the cover.

The Plies—There is a vast difference between belts of various makes, not alone in the weights of the duck of which the plies are made but also in the quality of duck used. Yet it is suprising how many belt users are satisfied wi'h a statement that a belt is made of, say, a 30-oz. duck. Some belt buyers do not even go that far; they are glad to know that the belt is made of so many plies. A moment's reflection will show how inadequate is the description of a belt that gives only the above specifications. It is the number of the plies, the weight of the duck and its quality that you must know. (The weight of a duck is decided by the weight of a piece of duck 36x42 in. in size.)

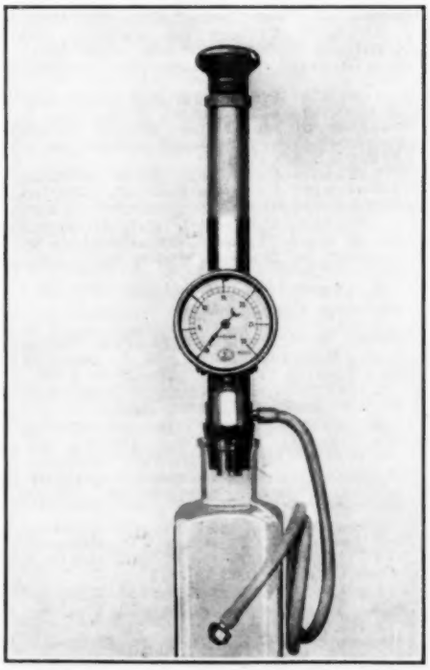
The Friction—Here is one of the most misleading, grossly exploited and most misunderstood factors. "Look," the belt salesman will say as he pulls the plies of his belt apart with apparent effort, "here is the strongest friction on the market. I can hardly pull it apart." And he will hand it to you proudly. "Try it yourself," he commands, sure of the result. And behold, the friction is "strong." "Gosh," you think, "here is a good belt." But is it? No! At least not necessarily. A "strong" friction that only tends to hold the plies rigidly so they cannot play freely and without rubbing on one another results in heat and deterioration. And the "strength" of a friction does not indicate its "life." Yet it is life you want, not strength. The purpose of the friction is to hold the plies together in a flexible bond throughout the whole life of the belt, and not merely to be of great strength when the belt is new, only to be sheared off after passing over the pulleys a few times.

The Cover—The purpose of the rubber cover is to protect the body of the belt from abrasive wear. It is a well-known fact that rubber, if properly compounded, will wear better and longer than the majority of substances. So it is not the thickness of the cover that counts, but the way in which it is compounded. A rubber compound can be suited for almost any purpose desired. Take a rubber eraser, for example, and compare it to the tread of an automobile tire.

The relation of cover, friction and plies is another important matter. There must be balance. Each should pass its stage of usefulness at the same moment. When the cover wears out long before the body of the belt, or the friction gives way and causes play-separation long before the cover is worn out, then there is a loss, a loss for which the purchaser pays. The most effective gage of any article is a record of its usefulness. A record of the actual service rendered by a belt will soon show the true value of it. The price you pay for a belt has little bearing upon its value until it is compared to the service the belt has rendered. You don't buy belting, you buy service.

Hand Vacuum Pump With Gage

There is a new device being put on the market designed to take the place of power vacuum pumps where the object to be exhausted is small. This pump has several very novel features which make it especially useful to chemists, doctors, dentists, and experimenters in general who have cause to need a vacuum of any degree. The pump has a rubber cork attached which fits a standard bottle tightly, so that by working the plunger a vacuum is created in the bottle.



ALSOP HAND VACUUM PUMP WITH GAGE

A means is supplied at the side of the pump for attaching a hose which leads to any object to be exhausted. When the pump is operated the air is drawn through the hose into the bottle, so that any liquid or other matter passes through the hose, into the bottle and not into the pump or gage.

Another use which presents itself for this vacuum pump arrangement is that it is possible to draw liquids from inaccessible places, such as steam traps, the bases of motor boat engines, etc. A very small rubber tube can be attached to the pump which can fit into small places, and will raise liquids up to 25 ft. by simply working the pump. Any liquid raised flows into the bottle and does not get into the pump, so that acids can be transferred without causing danger.

The vacuum gage shows the vacuum at all times, so that when distilling in a glass still under vacuum, it is possible to tell just how much vacuum is in the outfit at all times.

This equipment is being marketed by the Alsop Engineering Co., of 157 Water St., New York City.

Catalogs Received

U. P. Hungerford Brass & Copper Co., New York, N. Y.—A booklet describing the line of Monel metal which this company carries in stock.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.—Catalog 3044, describing medium and large size steam-driven air and gas compressors. This bulletin gives complete information on the construction and operation of this line of equipment.

Dings Magnetic Separator Co., Milwaukee, Wis.—A folder entitled "A Bolt Will Wreck Your Crusher."

Combustion Engineering Corporation, 43 Broad St., New York City—Bulletin CB2—A new bulletin describing the Coxe traveling grate stoker.

T. Shriver & Co., Harrison, N. J.—A new catalog entitled "Filter Presses for All Purposes" describing the Shriver line of filters and accessories.

J. Bishop & Co., Malvern, Pa.—A catalog entitled "Technical and Industrial Platinum" describing the uses of platinum and the various types of platinum equipment manufactured by this organization.

The Brown Instrument Co., Philadelphia, Pa.—A folder entitled "Automatic Control of Lehr Temperatures." This folder describes the use of Brown automatic control pyrometers at the Gill Glass Co., in Philadelphia.

Steere Engineering Co., Detroit, Mich.—Pamphlet No. 250. A leaflet on the subject of the manufacture of water-gas by the Young-Whitwell process.

International Motor Co., New York City—A booklet entitled "Mack Trucks in the Oil Industry," which describes the use of motor driven trucks of various kinds in connection with the mining and refining of petroleum.

Kimble Glass Co., Vineland, N. J.—A new catalog completely describing the varied line of glassware manufactured by this concern.

Personal

Dr. JOSHUA BERNHARDT, chief of the sugar division of the United States Tariff Commission, has left for Hawaii with a group of investigators, who will seek to determine the cost of sugar there.

HENRY L. COLES, who for the past 3 years has been acting as director of research for the Mosler Safe Co., Hamilton, Ohio, has recently been appointed general manager of one of its smaller companies, the Guardian Metals Co.—a company formed for the manufacture of burn-resisting metals. Mr. Coles was formerly lecturer in electrochemistry at Columbia University.

R. L. CORBY, director of the research laboratories of the Fleischmann Yeast Co., will start the symposium on "Bread Production" Sept. 11 at the twenty-sixth annual convention of the American Bakers' Association, which will be held at French Lick, Ind., the week of Sept. 9.

C. R. DELONG and E. M. WHITCOMB returned to the United States on the "Pittsburgh" Aug. 21, after having completed a number of investigations in the production of chemicals in different foreign countries. The data so obtained are to be used in connection with administration of the flexible tariff provisions of the act of 1922.

ELLERY K. FILES, chemical engineer, who for 3½ years has been connected with the Duratex Corporation, has recently been given entire charge of manufacture in the plant in Newark, N. J.

WILLIAM B. GILLIES, heretofore works superintendent of the Steel & Tube Co. of America, has been appointed district manager in charge of plants at Indiana Harbor, South Chicago, Evanston and Kalamazoo, Mich.

JOHN P. HARRIS, chemical engineer, of Kansas City, Mo., has been engaged by Charles E. Herrick, president of the Institute of American Meat Packers, and Thomas E. Wilson, chairman of the Institute Plan Commission, as director of the bureau of practical research, starting Sept. 1.

JOHN A. MCGILVRAY has been appointed chairman of the State Industrial Accident Commission, Sacramento, Calif., succeeding W. J. French.

W. O. RUTHERFORD, vice-president of the B. F. Goodrich Rubber Co., New York, has been elected president of the Rubber Association of America.

WILFRED W. SCOTT, editor of Standard Methods of Chemical Analysis, has received the degree of Sc.D. from the Colorado School of Mines. Dr. Scott was formerly connected with the General Chemical Co. at New York City.

PAUL WOOTON, Washington correspondent for *Chem. & Met.*, is now in Europe and expects to return about the middle of September.

Obituary

HARVEY H. BROWN, chairman of the Brown Hoisting Machinery Co., Cleveland, Ohio, died on Aug. 2, 1923.

JOHN I. ROGERS, an official of the Eagen-Rogers Steel & Iron Co., Crum Lynne, Pa., died at Philadelphia, on Aug. 15, following an operation for appendicitis. He was 40 years of age. He was graduated from the Engineering School, University of Pennsylvania, in 1904, and served as a Lieutenant in the United States Navy during the World War. He is survived by his wife and two children.

CHARLES B. WARNER, vice-president of the Warner Sugar Refining Co., New York, died at his residence, Great Neck, L. I., on Aug. 12, at the age of 44. He had been in ill health for the past 4 years, following a nervous breakdown. Mr. Warner was the second son of Charles M. Warner, founder of the Warner company, and was educated at Andover and the Sheffield Scientific School at Yale, graduating from the latter in 1902.

American Patents Issued August 14, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,464,496—Electric Furnace. C. A. Cadwell, Cleveland, Ohio, assignor to Electric Railway Improvement Co., Cleveland.

1,464,506—Electrolytic Process. J. S. Groff, Newport, R. I.

1,464,527—Method and Apparatus for Producing Sulphur Compounds. I. Hechenbleikner and T. C. Oliver, Charlotte, N. C., assignors to Chemical Construction Co., New York.

1,464,557—Process of Obtaining Lecithin From Vegetable Raw Materials. H. Bollmann, Hamburg, Germany.

1,464,580—Heat Regenerator. H. J. F. Philipon, Bellegarde-en-Forez, France.

1,464,598—Production of Vat Dyestuffs. L. C. Daniels, Buffalo, N. Y., assignor to National Aniline & Chemical Co., New York.

1,464,625—Electrolyte for Aluminum Production and Method of Preparing Same. A. Pacz, Cleveland Heights, Ohio.

1,464,627—Process for Refining and Purifying Animal Tallows, Oils, Fats and Greases. J. W. Ruwe, San Antonio, Tex.

1,464,634—Process for the Production of Basic Steel. R. Bauret, Paris, France assignor to La Société: Usines Metallurgiques de la Basse-Loire, Paris, France, Siege Social.

1,464,667—Explosive. W. O. Snelling, Allentown, Pa., assignor to Trojan Powder Co., New York.

1,464,689—Electrolytic Cell Structure. W. G. Allan, Toronto, Ontario, Canada, assignor to Toronto Power Co., Ltd., Toronto.

1,464,690—Wood Chipper. D. C. Andrews, Cloquet, Minn.

1,464,707—Process of Separating Wax From Mineral-Oil Lubricating Stock. C. H. Hapgood, Nutley, N. J., assignor to De Laval Separator Co., New York.

1,464,722—Lime-Hydrating Apparatus. H. Miscampbell, Duluth, Minn.

1,464,732—Cooling and Stabilizing Charcoal. O. F. Stafford, Eugene, Ore.

1,464,782—Electric Heating Appliance of the Immersed-Element Type. W. Stubbs, Mascot, New South Wales, Australia.

1,464,802—Dye and Process of Making Same. G. S. Bohart, Washington, D. C., assignor to G. H. Whittingham, trustee, Baltimore, Md.

1,464,805—Manufacture of Artificial Silk. E. Bronnert, Mulhausen, France.

1,464,816—Distributor for Cooling Towers and the Like. J. F. Grace, Kearney, N. J., assignor to Worthington Pump & Machinery Corp.

1,464,840—Electrolytic Apparatus. W. G. Allan, Toronto, Ontario, Canada, assignor to Toronto Power Co., Ltd., Toronto.

1,464,843—Process and Plant for Sorting, Washing or Classifying Mixed Materials of Different Specific Gravities or Volumes. M. Croquet, Montigny-le-Tilleul, Belgium.

1,464,844—Sublimation Process. C. R. Downs, Cliffside, N. J., assignor to Barrett Co.

1,464,845—Apparatus for Producing Chemical Reactions. C. R. Downs and C. G. Stupp, Cliffside, N. J., assignors to Barrett Co.

1,464,851—Process of Producing Resin. S. P. Miller and J. B. Hill, Philadelphia, Pa., assignors to Barrett Co.

1,464,862—Method and Apparatus Relating to the Production of Metals. C. W. Balke, Highland Park, Ill., assignor to Fansteel Products Co., North Chicago, Ill.

1,464,918—Apparatus for Treating Hydrocarbons. B. Andrews, Houston, Tex.

1,464,928—Bituminous Emulsion. C. N. Forrest, Rahway, N. J. assignor to Barber Asphalt Co., Philadelphia, Pa.

1,464,949—Composition for Use in Manufacturing Artificial Fibers, Films, Leather and the Like and Process of Making the Same. R. J. Löffler, Dresden, Germany, assignor to W. L. Voigt, New York.

1,464,984—Process for Producing Ammonium Nitrate and Aluminum Hydroxide. A. Foss, Christiania and T. Mejdell, Skoien, near Christiania, Norway, assignors to Norsk Hydro-Elektrisk Kvaelstof-Aktieselskab, Christiania.

1,464,990—Manufacture of Sodium Fluoride. H. Howard, Cleveland, Ohio, assignor to T. Grasselli Chemical Co., Cleveland.

1,465,001—System for Treating Activated Sludge. W. J. Sando, Milwaukee, Wis.

1,465,010—Process of Separating. G. R. Young, Huntington, N. Y., assignor, by mesne assignments, to Young Sand & Gravel Co., New York.

1,465,020—Apparatus for Concentrating Solutions. E. Monti, Turin, Italy.

1,465,034—Process for the Electrolytic Deposition of Copper. F. L. Antisell, Perth Amboy, N. J.

1,465,092—Process of Making Artificial Leather. R. B. Respess, New York.

1,465,107—Manufacture of Metal-Coated Paper. K. Wickel, G. Holecek, Feucht, near Nuremberg, Germany.

1,465,131—Method of Producing Charcoal and Apparatus Therefor. S. Hiller and L. A. Clarke San Jose, Calif., assignors to Pacific By-Products Co., San Jose.

1,465,156—Filter. J. W. Bucher, Denver, Colo.

1,465,173—Method of Electrodepositing Cobalt and Chromium. H. C. Peffer and H. C. Pierce La Fayette, Ind., assignors to J. C. Patten, Kokomo, Ind.

1,465,227—Oil Press. R. S. Matheson, Manila, Philippine Islands.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Industry and Trade

Current News and Market Developments

Summary of the Week

Plans for Chemical Exposition point to very interesting show this year.

A.C.S. to co-operate with army in developing a khaki dye.

British Dyestuffs, Inc., shows big profits.

Cornell Aggie acquitted in suit for damages for accident in chemical laboratory.

W. G. Campbell to direct regulatory work for Department of Agriculture.

Canada expects United States capital to invest there in event of embargo.

Sale of dyes, seized by the French in the Ruhr, is now under way.

First-hand information on production cost of chemicals obtained by representatives of Tariff Commission in Europe.

Import trade for first half of year reveals material gain in inward movement of chemicals.

Producers revise price schedules for less than carlot quantities of soda ash and caustic soda.

Acetate of lime and methanol show gain in output for first half of year.

Production Costs of Foreign Chemicals Obtained for Tariff Commission

Cost Figures Will Be for Confidential Use of Commission—Various European Countries Visited

WHEN the United States Tariff Commission holds its formal hearings on sodium nitrite Sept. 10, it will have the advantage of first-hand information regarding production conditions and costs in Norway and Germany. C. R. DeLong, chief of the Chemical Division, and E. M. Whitcomb, accountant, returned to the United States on the S.S. "Pittsburgh," Aug. 21, after nearly 4 months' study of the chemical industries of England, Norway, Germany, Switzerland, France and Holland. The party, after being joined by other of the commission's representatives already in Europe, completed investigations of conditions affecting the foreign production of sodium nitrite (in Germany and Norway), barium peroxide (in England, Germany and France), oxalic acid (in Holland and Germany), potassium chlorate (in Germany and France), veronal (in Switzerland), linseed oil (in England and Holland) and cresylic acid and phenol (in England and Germany). While it was not possible in the case of every commodity to obtain actual data on costs, the investigators were able to collect much pertinent information of value regarding power and labor costs, raw material resources, etc.

Mr. DeLong reports that in general the manufacturers whose agents in this country were petitioning for a tariff reduction were usually anxious to cooperate with the Tariff Commission; their plants were thrown open and their cost sheets were placed at the commission's disposal. On the other hand, when it was evident that the foreign manufacturer had little chance to profit by giving information, little or no cooperation was shown. The British chemical industries proved the most friendly to the commission's approaches, while most difficulty was encountered in France.

Costs for These Commodities

The cost figures given by the individual manufacturer will be for the confidential use of the Tariff Commission and will be revealed only in the form of general averages. Actual cost of producing linseed oil was obtained in England from firms representing approximately 75 per cent of that country's crushing capacity. Comparable data on Dutch production were also obtained. In the case of barium peroxide, for which both increases and decreases in duty are petitioned, costs were obtained in England, France and Germany. The Swiss manufacturers of veronal supplied the commission with the information desired, and the same was true in the case of the British production of cresylic acid and phenol. On the other hand, both French and German producers of potassium chlorate refused to reveal their production costs.

Mr. DeLong and his party made a thorough inspection of the work of the Norwegian Hydro-Electric Co., Ltd., of Christiania, where nitric acid and calcium nitrate and sodium nitrate are made by the arc process in the Birkeland-Eyde furnaces. Although actual costs were not available, figures were obtained for power and raw material costs that will put the commission in a position to give a reliable estimate on the cost of producing sodium nitrite. Oxalic acid plants using the synthetic (carbon monoxide-sodium formate) process were visited in Holland and Germany and actual production data obtained.

The results obtained from these investigations will form the basis for the Tariff Commission's administration of the flexible-tariff provision of the tariff act of 1922, and the effectiveness of their use at this time will largely determine the practicability of further foreign investigations of this sort.

M. C. Donk, chemical expert, who went abroad with Mr. DeLong and assisted in the investigations made, has remained abroad and will spend several weeks to complete investigations into costs of producing linseed oil.

A point which so far has been overlookcd in most flexible-tariff discuss'ons is the inherent advantage of the importer who is petitioning for a reduction in duty. He can prove to his foreign principal that it is to their mutual advantage to give the Tariff Commission the information it desires on production costs—particularly if there is reason to believe that these figures are higher than domestic costs. On the other hand, the American manufacturer can claim that the foreign producer has a considerable advantage in the way of lower costs—but of course he has no way of proving it once his foreign rival refuses to give the information to our government.

Import Trade in Chemicals for First Half of Year Shows 40 Per Cent Gain

IMPORTS of chemicals and allied products were on the upswing during the first 6 months of 1923. An exact comparison with the corresponding period of 1922 cannot be made owing to the change in classification necessitated by the changes in the import schedule. A conservative estimate would place the gain at over 40 per cent, with total imports aggregating $127,009,307 for the January-June, 1923, period.

Fertilizers took the lead in the groups showing gains, the values rising from $17,823,686 in the first 6 months of 1922 to $36,073,592 in first 6 months of 1923. The rapid rise in prices of nitrogenous fertilizers accounted for the increase of nearly 200 per cent in value and the decrease of nearly 25 per cent in quantity. During the January-June, 1923, period, 639,692 tons, with a valuation of $30,040,271, was received. Over four-fifths of these fertilizers were sodium nitrate.

The trade in gums, resins and balsams represents another indication of the healthy condition of the industries dependent upon these materials. Imports expanded 65 per cent in value, from $16,505,728 in the first 6 months of 1922 to $27,323,920 in the first 6 months of 1923, and surpassed the year of 1921 total by 21 per cent, or nearly $5,000,000, and fell short of the 12 months of 1922 figure by 12 per cent.

Purchases of gum arabic swelled in 1923, more than doubling the value in the 6 months period of 1922, from $345,609 (4,167,252 lb.) to $888,432 (6,976,572 lb.) and surpassed the total valuation for the years 1921 and 1922.

Receipts of copal, damar and kauri gums improved in value from $1,947,167 in January-June, 1922, to $2,134,033 in January-June, 1923, but diminished in quantity from 17,463,631 lb. to 12,224,083 lb.

The inward movement of shellac broadened, exceeding the corresponding period of 1922 73 per cent in value and 54 per cent in quantity and nearly reaching the figure for the entire year of 1922. The amount received was 22,331,809 lb., valued at $14,498,420.

Coal-Tar Imports Increase

An expansion of 55 per cent was recorded in the imports of coal-tar chemicals, $8,202,926 having been entered from January-June, 1923, while during the whole year of 1922 $11,012,769 was received. The large increases were made for the most part in importations of "crudes." Coal-tar medicinals, which represented a loss of 50 per cent in exports during 1923, declined $831 worth in imports, which, however, still exceeded the exports by $35,449. Receipts of alizarin and derivatives have been waning during this year.

The extracts for dyeing and coloring, etc., expanded from $116,252 (1,736,159 lb.) to $172,043 (2,139,861 lb.) in 1923.

Unusually large amounts of arsenious acid or white arsenic reached the United States until $1,083,972 (11,347,746 lb.) was entered for consumption during the first 6 months, as compared with the very low figure of $20,505 (272,728 lb.) for the corresponding period of 1922, and of $253,250 (3,338,025 lb.) for the 12 months of 1921.

In contrast to this, but half the amount of citric acid was shipped to this country by foreign countries during 1923. In January-June, 1923, $184,222 (591,247 lb.) came in, as compared with $385,059 (1,089,052 lb.) in January-June, 1923.

Imports of oxalic acid made big strides, most of the gain having been registered in the last 4 months of the year. For the first 6 months of 1922 but 9,253 lb., valued at $1,269, was entered in the United States, while during the 12 months of 1922, 1,294,236 lb., valued at $106,627, was received. During the first 6 months of 1923 1,581,064 lb., valued at $125,392, was imported. It is interesting to note that the amounts taken in so far in 1923 surpassed the total receipts of 1921 and 1922 and nearly equaled the 1920 figure of 1,789,452 lb.

A big jump was made in receipts of sulphuric acid, from $16,854 (1,644,659 lb.) in January-June, 1922, to $144,060 (16,864,153 lb.) in January-June, 1923.

But half the quantity, or 923,644 lb. ($230,285), of tartaric acid was imported in the first 6 months of 1923 as in the first 6 months of 1922.

During the January-June, 1923, period, imports of alcohol, including fusel oil, amounted to $599,311.

That the volume of foreign trade in bleaching powder was diminishing was further proved by the large reduction in amounts despatched from foreign ports to this country. Receipts dropped from $103,513 (7,656,674 lb.) in January-June, 1922, to $29,353 (847,804 lb.) in January-June, 1923.

The amounts of citrate of lime brought into the United States in 1923 fell to $22,686 (186,874 lb.) from $1,213,478 (9,113,304 lb.) in 1922. It is significant that no shipments arrived in January, February, April or June, nearly the entire amount coming in in May.

Imports of potassium bitartrate, crude, argols of wine lees expanded from a total valuation of $680,908 in the first 6 months of 1922 to $710,598 in the corresponding period of 1923, but declined in quantity from 9,762,638 lb. to 8,746,747 lb.

China wood oil has reflected the rapid growth of the paint industry by a 70 per cent increase, from $3,286,318 (4,496,412 gal.) in the first half of 1922 to $5,584,061 (5,868,431 gal.) in the first half of 1923.

On the other hand, linseed oil dropped 70 per cent, from $8,305,935 (93,171,833 lb.) to $2,431,202 (26,228,836 lb.), over 60 per cent of which was received during the second quarter of 1923.

The trade in casein or lactarene has been exceedingly active and represented a jump of 545 per cent in value, from $506,845 (7,032,865 lb.) in January-June, 1922, to $3,274,387 (18,784,669 lb.) in January-June, 1923.

British Dyestuffs, Inc., Shows Large Profits

The report of the British Dyestuffs Corporation, in which the British Government is financially interested, for the year to Oct. 31, 1922, shows a net profit of £102,656, contrasted with a loss of £1,006,660 for the preceding year, according to a report to the Department of Commerce from Alfred Nutting, clerk in the consulate-general at London. This profit is arrived at after providing £411,382 for depreciation and after crediting the further amount estimated to be recovered in respect of excess profits duty.

The directors state that continued progress has been made in research and in the improvement of manufacturing processes, and they assure stockholders that the undertakings are now capable of meeting, to a very large extent, the requirements of the color users of the United Kingdom.

In the financial year ended Oct. 31, 1921, in addition to the loss stated above, £1,443,343 had to be written off stock values. The liquidation of surplus stocks has now been completed and stocks on hand (on Oct. 31 last, totaling £1,870,372) have been written down to current values.

It is proposed to liquidate the associated Huddersfield and Blackley companies and Claus & Co., transferring the undertakings to the parent concern, which will then become the sole operating company.

In the former report the directors referred to the heavy imports of "foreign dyestuffs valued at over £7,000,000." The position since has changed radically, as these figures of imports of finished dyestuffs show: 1920, £7,535,000; 1921, £1,539,000; 1922, £1,326,000.

Decline in Copra at Manila

According to a cable received by the Department of Commerce from Trade Commissioner John A. Fowler, Manila, P. I., the price of copra declined during July 1 peso per picul for Manila corriente, closing at 9 pesos. Parity with American and European markets was almost reached, although further decline is expected to meet greater resistance. The rain has interfered with harvesting. Total Manila receipts approximately 200,000 piculs, against 275,000 piculs last July.

Coconut oil trading continued inactive due to lack of demand of the United States. Early recovery is not expected and production is still low. The month's exports were 7,000 tons.

Washington News

Seized German Dyes Offered for Sale

Trade Commissioner Breithut has cabled the Department of Commerce that the inventory of seized German dyes has been completed and stocks have been offered for sale.

The total stocks amount to 6,200 metric tons, valued at about 200,000,000 francs, he reported, of which Belgium received 1,000 tons and France 800 tons for home consumption. Of a surplus of 3,800 tons France will sell 1,000 and Belgium 500 tons of indigo and alizarine immediately. Of the remaining 2,300 tons, about 50 per cent is competitive and will probably be divided equally between France and Belgium. This quantity contains large amounts of alizarine blue G.C.D. and alizarine black S, also 60 tons of 100 per cent rhodamine.

Sale of Belgium's share by Lazard Godchaux, he declared, will probably be so conducted as not to disturb the American market. The syndicate Francaise des Producteurs des Matières Colorantes will sell the French share, probably 80 per cent.

Present reports indicate the products will be sold gradually and at high prices. Dumping and bargain sales are unlikely, as efforts will be made to realize a maximum amount of money. It is impossible to secure assurances on the sales policy of the Compagnie Nationale, the report added.

French Chemical Market Dull

A seasonal dullness exists in the French chemical industry, according to a cable received from Commercial Attaché Chester Lloyd Jones, at Paris. Dyestuffs sales are reported satisfactory, with bleaching materials fair. The paint season is poor and market of nitrate of soda is dead. Spot stocks of the latter commodity are low, but the future is well sold. Further purchases have been checked due to rising sterling. Stocks at the end of July amounted to 14,800 tons, as compared with 90,600 tons same date last year and 260,000 tons in 1921. Sizable shipments are afloat. Sulphate of ammonia for July and August delivery was rapidly absorbed at the end of July. September prices have not yet been announced. A large part of the seizures at Oppau are reserved for the liberated regions. Cyanamide is especially active due to shortage of sulphate of ammonia. Business is good in potash fertilizers. Sales of sylvanite are heavy for the coming season. Superphosphate demand is light. Purchases for central and southern regions are discouraged by the overproduction of wine last year. Buyers are awaiting results of present harvest.

Walter G. Campbell to Direct Regulatory Work

Appointment of Walter G. Campbell, now acting chief of the Bureau of Chemistry, as director of regulatory work of the United States Department of Agriculture, a new position created by Congress, is announced by Secretary of Agriculture Wallace. In his new position Mr. Campbell will assist the Secretary of Agriculture in administering the law enforcement work of the department. It is expected that he will take up his new duties about Oct. 1 upon the arrival of Dr. C. A. Browne, the new chief of the Bureau of Chemistry. As director of regulatory work for the department, Mr. Campbell will, under the Secretary, have the general supervisory administration of the regulatory acts which it enforces. Among the most important of these is the food and drugs act, the meat inspection act, the insecticide and fungicide act, the plant quarantine act, the tea inspection act, the migratory bird treaty act, the cotton futures act, the grain standards act, the warehouse act, the packers and stockyards act, the futures trading act and the naval stores act.

German Chemical Industry Depressed

In spite of the great depreciation of currency, the German chemical industry shows a change for the worse, according to an article by the Berlin correspondent of *European Commercial*, Vienna, published July 7, and which is quoted in a report to the Department of Commerce by American Consul E. Verne Richardson, at Berlin.

Exports of dyes, pharmaceutical products and fertilizer have decreased in totals, despite increases to certain countries. Profits of chemical factories, if calculated on a gold mark basis, are "far below those of last year and infinitely lower than those of pre-war years," the article says. The dividend of Bayer & Co., for instance, totals 528,000 gold marks, compared with 10,000,000 gold marks in 1913. The dividend of Meister Lucius & Brüning corresponds to $75,428, as against $382,470 in 1921.

Concentration in the German chemical trade is on the increase, the article shows. The number of concerns decreased to 14,909 in 1922, compared with 15,042 in 1913 and with 15,116 in 1921. The number of employees has increased, however, being 421,356 in 1922, compared with 277,629 in 1913 and with 373,741 in 1921, an increase of 51.77 per cent compared with the pre-war year.

Exports of dyes to China, Japan and east Asia continue to increase, the article states. In the last few months two German dye factories were founded in Japan, with the participation of Japanese capital. Exports of aniline dyes to China exceeds in value the pre-war figures.

Exports of aniline dyes and bronze metal dyes to the United States have increased, while alizarine dyes, copper dyes and others have decreased. Exports to England also have decreased, the article concludes.

Gain in Acetate of Lime Production

The Department of Commerce announces the production of acetate of lime for the first half of 1923 as 85,355,551 lb., as compared with 52,985,256 lb. in the first half of 1922, while methanol output was 4,609,345 gal. in the first half of 1923, as compared with 2,941,960 gal. in the first half of 1922, based on reports received by the Bureau of the Census.

The following table shows revised figures obtained from almost the entire industry, beginning with January, 1920, indicating total production in the industry each month. All figures are those actually reported except for April, May and August, 1920, when the small reporting capacity made it necessary to prorate the figures to an equivalent daily capacity of 5,000 cords for better comparison with other months:

Year	Acetate of Lime, Lb.	Methanol Gal.
1920	149,045,046	7,824,247
1921	58,616,063	3,895,043
1922	124,430,166	6,795,648
1923 (6 mos.)	85,355,531	4,609,345

New Agriculture Bureau Formed by Chamber of Commerce

Creation of a bureau of agriculture was announced last week by the Chamber of Commerce of the United States. The bureau will function as a part of the chamber's natural resources production department, one of eight departments which carry on the activities of the national chamber. The manager of the new bureau will be William Harper Dean, of Washington, formerly with the United States Department of Agriculture.

"The new bureau," according to the announcement, "has been set up by the national chamber to function upon agricultural problems as agriculture's lines of interest cross or touch those of business in general." The chamber feels that the inauguration of this work is a step forward in the direction of new constructive service.

"In keeping with the general policy of the national chamber, the new bureau will make no effort to formulate on its own initiative any plans to offer for adoption by either agriculture or other industries, but rather to serve as an investigator of their common problems and to offer the results of these studies for such action as they may seem to warrant."

Unusually Attractive Program Arranged for Chemical Exposition

This Year's Show Includes About 400 Exhibits—Students' Course a Feature—Movie Program Extensive—Plans Now Complete

PLANS for the 1923 Chemical Exposition, which will open at the Grand Central Palace, New York, on Sept. 17 and extend for one week, opening daily at noon and closing at 10 p.m. are about completed. Outside of the four hundred or more exhibits that are expected by the time the exhibition opens, two other features have been planned for this year. They are a moving picture program of industrial films to be shown each afternoon and evening in a special auditorium for the purpose, and an intensive course in the practical business side of chemical engineering for students in various universities all over the country. Upward of 200 students have already enrolled for the course. About thirty authorities in various fields of chemical engineering will discuss their specialties for the benefit of the students. Prof. W. T. Read of Yale University is in general charge of the student course feature. The plans for 1923 do not include any list of general speakers, as in previous years. The exposition will be opened officially on Monday, Sept. 17 at 2 p.m. by Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers' Association and chairman of the exposition advisory committee.

Thus far several associations of the chemical industry have arranged to hold meetings during the week of the exposition. The American Ceramic Society will hold a meeting and the Technical Association of the Pulp and Paper Industry will hold its usual fall meeting in conjunction with the exposition. H. S. Taylor of Dayton, Ohio, president of the association, will preside. The regular fall dinner of the American Institute of Chemical Engineers will be held during exposition week at the Park Avenue Hotel, New York. The annual banquet and election of officers of the Salesmen's Association of the American Chemical Industry will also be held during the week at one of the nearby Pershing Square hotels.

Motion Picture Program

The motion picture program for the exposition has not as yet been completed, but to date the following films have been officially placed on the program:

"The Story of Duriron as a Non-Corrodible Material for Chemical Apparatus" (1 reel), courtesy of the Duriron Co.

"Operations of a Nickel Rolling Mill Producing Sheet and Wire" (5 reels), courtesy of International Nickel Co.

"The Story of Sulphur and How It Is Secured" (2 reels), courtesy of U. S. Bureau of Mines and Texas Gulf Sulphur Co.

"The Story of Asbestos and Its Manufacture: (4 reels), courtesy of the Johns-Manville Co. and U. S. Bureau of Mines.

"Saving Coal in the Home" (1 reel), courtesy of U. S. Bureau of Mines.

"The Diary of an Abrasive Stone" (4 reels), courtesy of U. S. Bureau of Mines and Carborundum Co.

"Water Power" (2 reels), courtesy of U. S. Bureau of Mines and Westinghouse Electric & Manufacturing Co.

"The History of Transportation" (2 reels), courtesy of U. S. Bureau of Mines and Westinghouse Electric & Manufacturing Co.

"The Story of Motor Truck Transportation" (3 reels), courtesy of U. S. Bureau of Mines.

"Story of Steel" (6 reels), courtesy of U. S. Bureau of Mines.

"When Wages Stop: Showing Safety First in the Petroleum Industry" (4 reels), courtesy of U. S. Bureau of Mines.

"Story of Fireclay Refractories" (4 reels), courtesy of U. S. Bureau of Mines.

"Talc Mining in Ontario" (1 reel) and

"Gold Mining in Northern Ontario" (1 reel), both courtesy of the Ontario, Canada, Department of Mines.

"King Cotton" (1 reel).

"Minerals and Metals" (1 reel).

"Electricity at Work" (1 reel), all courtesy of Alabama Power Co.

The following includes the subjects in full and the list of speakers who have agreed at present to take part in the program of the student course at the exposition:

Student Course Program

Disintegration—Crushing and Grinding.

General discussion, Galen H. Clevenger, Boston.

Other speakers: S B. Kanowitz, Raymond Bros. Impact & Pulverizing Co., New York, and Paul W. Webster, K-V Pulverizer Co., on "Hammer Mill Pulverizing"; H. F. Kleinfeldt, Abbe Engineering Co., New York, on "Combined Grinding & Mixing"; H. Hardinge, Hardinge Co., New York, on "Crushing and Grinding."

Mechanical Separation—Grading.

General discussion, Galen H. Clevenger, Boston.

Other speakers: Hugh Garvin, Orville Simpson Co., Cincinnati, Ohio.

Separation of Solids From Liquids—Thickening, Filtration, Centrifugal Separation.

General discussion, H. N. Spicer, Dorr Co., New York.

Other speakers: Walter D. Cleary, De Laval Separator Co., New York, "Centrifugal Separation of Solids From Liquids"; Arthur Wright, Filtration Engineers, New York, "Separation by Filtration"; Eugene E. Ayres, Sharples Specialty Co., Philadelphia, "Application of Centrifugals to Separation and Clarification"; T. A. Bryson, Tolhurst Machine Works Troy, N. Y., "Centrifugal Separation and Filtration."

Separation With Phase Change—Evaporation, Distillation, Drying.

General discussion, W. H. McAdams, Massachusetts Institute of Technology.

Other speakers: R. W. MacGregor, Ernest Scott & Co., Fall River, Mass.; F. M. DeBeers, Swenson Evaporator Co., Harvey, Ill., "Evaporation"; F. E. Finch, Ruggles Coles Engineering Co., New York, "The Ruggles-Coles Drier."

Handling of Materials.

General discussion—A. E. Marshall, Baltimore.

Other speakers: Harry Carlson, Sandvik Steel, Inc., New York, "Conveying With Steel Belting"; S. G. Ketterer, Schutte & Koerting Co., Philadelphia, "Pumping by Use of Jet Apparatus"; G. L. Montgomery, *Chemical & Metallurgical Engineering*, "Interdepartment Handling of Materials."

Materials of Construction, What Materials to Use; When, Where and Why.

General discussion, W. S. Calcott, Wilmington, Del.

Other speakers: Ross C. Purdy, secretary, American Ceramic Society, Columbus, Ohio, "Ceramic Materials—Clay, Glass, Silica and Enameled Ware"; O. I. Chormann, Pfaudler Co., Rochester, N. Y., "Glass-Enameled Steel Products as Materials of Construction"; E. A. Turner, International Nickel Co., New York, "Nickel and Monel Metal"; S. Skowronski, Raritan Copper Works, Perth Amboy, N. J., "Copper and Brass as Materials of Construction"; Homer Hendricks, New Jersey Zinc Co., New York, "Zinc and Zinc Products as Materials of Construction"; M. A. Knight, Maurice A. Knight, East Akron, Ohio, "When, Where and Why to Use Chemical Stoneware"; W. H. Gaylord, Quigley Furnace Specialties Co., New York, "Furnace Wall Construction"; P. S. Kingsbury, General Ceramics Co., New York, "Silica Ware."

Chemicals in Commerce—The Distribution of Chemicals.

General discussion—E. V. Peters, New Jersey Zinc Co., N. Y.

The discussions of these subjects on the student program will be supplemented by recitation and conference periods and directed inspection of exhibits. The course will be finally reviewed in class and a written report will be required by those in charge of the course. It is understood that some of the colleges and universities sending students will allow full credit for work in this course. Columbia University has offered the use of its dormitories for students attending the course.

News Notes

Los Angeles as a sugar port is forecast in the construction on Terminal Island of a receiving and shipping plant by the California-Hawaiian Sugar Refining Co. Three 25,000-gal. tanks for the storage of Hawaiian molasses are under construction, and work will begin immediately on the remaining units of the plant.

New crushing equipment is being added to the plant of the Pacific Lime Co., which owns extensive limestone deposits on Texada Island, B. C., to enable it to carry out a contract to supply the Granby Co. with 25,000 tons of broken limestone within the next 12 months.

Prevention of mildew and rotting of mailbag fabric is receiving much attention by the Post Office Department. A new secret process is being tested out. In service there are 270 specially prepared bags, of which one-third have been treated, one-third have been half-treated and one-third have received no treatment whatever.

The Continental Wood Products Co., Ltd., has acquired 1,046 sq.mi. of timber in the Sudbury and Algoma districts, Province of Ontario, and plans have been completed for the erection of a kraft pulp mill at Alsacex at a minimum cost of $1,500,000.

The Senate appropriation bill, Georgia State Legislature, Atlanta, includes an appropriation of $10,000 for the establishment of a state ceramic school at the local Georgia School of Technology. This appropriation will be increased to about $30,000 by contributions from manufacturers and others.

The Florida Sugar & Food Products Co., Cane Point, La., is operating at its new local sugar mill, constructed at a cost of about $500,000, and purposes to develop maximum output. The mill has a rating of 400 tons of cane per 24 hours, producing about 100 tons of sugar. A large working force is being employed. With 300 acres of local lands planted in cane, about 800 additional acres is now being cleared for additional planting for raw material supply; 500 acres, owned by individuals, also is available.

The Toronto Cement Corporation has commenced the construction at Beachville, Ont., of a cement plant which will have a production of 4,500 bbl. of cement a day.

The Buffalo Foundry & Machine Co., builder of vacuum drying and chemical apparatus, has taken over the interests of the Cannon-Swenson Co. of Chicago, well known to the sugar industry as consulting and contracting engineers. Martin J. Kermer, formerly the chief engineer and general manager of the Cannon-Swenson Co., is to remain in charge of the Chicago office.

Small Output of Arsenic in Canada

Production in 1922 Only 2,576 Tons, but Represented Increase Over 1921

VICE-CONSUL G. G. BLAKE, JR., in a report from Ottawa says that Canadian arsenic for many years was derived from the arsenical gold-quartz mines of Hastings County, Ontario, and for a short time, in a lesser degree, from the arsenical gold mines around Arsenic Lake and Net Lake, near Timagami, in the Nipissing district of Ontario. From 1904 to the present time these mines have been idle, and the arsenic output has come almost entirely from the treatment of the residues, containing cobalt, nickel, arsenic and a little silver, obtained in the mining and milling of the silver ores of Cobalt and adjoining areas in the Temiskaming district of northern Ontario. Since 1909 the production of white arsenic has averaged approximately 2,000 tons yearly. Most of this output is sent to the United States.

For many years the gold-arsenical concentrates produced in the treatment of the ores of the Nickel Plate mine, operated by the Hedley Gold Mining Co., at Hedley, B. C., were sent to Tacoma and payment was made on the gold content only. In 1917 the smelting company at Tacoma installed an arsenic burner, and since that date the Hedley company has been receiving returns on part of the arsenic contained in the concentrates as well as for the gold values. In 1922 approximately 500 tons of arsenic was recovered by this smelter. Most of the 2,516 tons, valued at $97,763, which left Canada in the years 1917 to 1920, came from the Nickel Plate mine.

On the whole, the Canadian production of arsenic in the form of ores and concentrates has been relatively small. In 1922 an increase of 73 per cent in quantity but only 37 per cent in value was noted, compared with figures for 1921. Approximately four-fifths of this amount came from the smelting of silver-cobalt-nickel ores of the Cobalt district, and 500 tons, as mentioned previously, from the Hedley mine in British Columbia.

Items	1921 Quantity	1921 Value	1922 Quantity	1922 Value
Production:				
From arsenica concentrates, tons	.....	.....	518	$21,097
White arsenic, tons	1,491	$233,763	2,058	299,940
Total	1,491	233,763	2,576	321,037
Imports:				
White arsenic, lb	1,847	230	441,168	32,520
Sulphide of arsenic, lb	185,685	26,348	525,246	39,264
Arseniate of soda, lb	11,993	3,002	7,961	1,402
Exports:				
Arsenic, metallic	.....	.....	222	5,238
Arsenic, n.o.p., tons	767	108,535	1,367	198,005

Arsenopyrites occur in the ores of some of the gold-quartz mines of Nova Scotia, but the only property reporting shipments of arsenical concentrates is the Richardson mine, at Goldboro, Guysborough County, Nova Scotia. From 1907 to 1910, inclusive, 2,413 tons, valued at $37,662, left this mine, the average content being about 39 per cent. It is estimated that from 800 to 1,000 tons of concentrates, probably containing 25 to 35 per cent or more of arsenic, are lying on the dumps of several of the gold mines in Nova Scotia. The Mines Branch, Department of Mines, Ottawa, has started an investigation of the gold-arsenical mines of this section with the view of helping operators to resume activities.

The table herewith includes statistics for the Canadian production, imports and exports of arsenic in 1921 and 1922.

The price of arsenic rose from 7c. in March to 13½c. in December, 1922, with an average of 8.5c. for the year, compared with 8.85c. in 1921. The need for arsenical insecticides to combat the boll weevil in the cotton districts of the southern United States increased the demand for white arsenic.

Chemical Plant Increases Capacity at San Diego

Following the acquisition of the California Chemical Co., San Diego, Calif., by Stanley H. Barrows, president of the National Kellastone Co., plans are being perfected for the dissolution of the purchased company and the organization of the California Chemical Corporation, to take over the plant, leaseholds and other properties. Mr. Barrows will head the new company. Extensions and improvements will be made in the present works for an increased output of flake magnesium chloride, potash and epsom salts.

Phonograph Record Factory to Be Built at Hollywood

A phonograph record factory, with a capacity of 100,000 double records daily, will be erected at Hollywood, Calif., by Edward R. Harris, for many years associated in an executive capacity with phonograph and record producers and who holds several patents for non-breakable records.

The new factory will be equipped with the modern recording as well as the newest production devices. Mr. Harris was influenced to establish the plant in Hollywood because Los Angeles and Hollywood are the home of many musical artists.

A.C.S. to Co-operate With U. S. Army in Production of Uniform Khaki

Properties of Fabrics Carrying Various Dyes to Be Tested for Wearing Qualities

APPOINTMENT of a committee to work with the United States Army in conducting a sweeping competition of American dyes is announced by the American Chemical Society.

The army, it was stated, is seeking a domestic dye to make all olive drab look alike. The faded and bleached cotton of many hues now worn by General Pershing's men will be replaced by a garb uniform in color.

Tests of dyes made in this country will be carried out in New England mills by the society's committee headed by Dr. J. Merritt Matthews, New York chemical engineer. Other members of the committee, which is acting under the direction of Quartermaster-General Ballinger of the army, are Prof. L. P. Olney of the Lowell, Mass., Textile School and W. T. Joyce of Providence, R. I.

The task of the committee, Dr. Matthews said, is to reach conclusions as to the relative fastness and acceptability of four classes of dyes. Cotton cloth to be dyed in New England will be converted into uniforms, which will be worn by four companies of American soldiers in the tropics. Each company will wear uniforms colored with a different dye, affording a test of the ability of each dye to withstand army usage under trying conditions of climate.

"If sulphur dyes can be made acceptable to the War Department, these dyes would do," said Dr. Matthews. "If not, the army can fall back on mineral dyes or vat dyes. If vat dyes are too expensive, resort can be had to mineral dyes, as in England. Alizarine might be used in connection with mineral dyes, but this requires a mordant.

"The committee of the American Chemical Society has met with Quartermaster-General Ballinger and with the dyestuff manufacturers to discuss what dyes are available in this country for dyeing the new olive drab uniform. Before the war the old olive drab uniform dyed well, because the vat colors came from Germany. Vat colors are now available here. Olive drab is a modification of khaki. Sulphur during the world war did not give very fast shades.

"There are four ways out: First, the use of vat colors, which will do, but are expensive; second, the use of mineral colors, the objection to which is that they make the goods hard, sewing being difficult; third, alizarine colors, a method of dyeing considered difficult; fourth, sulphur colors, which, it is held, have been improved since the war and possibly are now available as being fast enough for army purposes.

"Recently the United States Marine Corps let a contract to an English firm, rejecting the bids of American manufacturers. The English firm bid on piece dye, which is an old mineral dye. The United States dyers were asked to bid on fiber dye, presumably vat colors. Bidding under identical conditions, American manufacturers can compete successfully with the manufacturers of England, for, although dyeing can be done more cheaply in English plants, the import duty wipes out this advantage."

Have You a Little Radio in Your Home?

If so, tune in on WJZ, New York, on any Wednesday evening in September, between 8:15 and 8:30 and you will hear a worth-while talk on some interesting phase of engineering. These talks, given by McGraw-Hill editors, include a talk on Sept. 5, by Earl E. Whitehorne, commercial editor of *Electrical World*, on "Who Has More Slaves Than Pharaoh?" On Sept. 12, Kenneth H. Condit, editor of *American Machinist*, will talk on "Automatic Machines and Their Effect on Men." "The Work of the Chemical Engineer," by H. C. Parmelee, editor of *Chem. & Met.*, follows on Sept. 19, while E. J. Mehren, editor of *Engineering News-Record*, talks on Sept. 26 concerning "What Engineering Is and What It Is Not."

American Investments Expected in Event of Pulpwood Embargo

It is the belief of many business men, government experts and others in Canada who have given the subject close study that if the government puts into effect an embargo on the export of pulpwood, one of the first consequences will be the establishment of pulp and paper mills in British Columbia by various American capitalist groups which in the past have been negotiating with a view to establishing in the province but have hesitated to order actual construction for one reason or another.

American capital is already heavily interested in British Columbia pulp and paper enterprises, and within the last few months there has been talk of American money establishing several other mills. It is held that an embargo on pulpwood exports would be the decisive factor in bringing matters to a head.

Chile Considering International Exposition

Among the projects being discussed in the present session of the Chilean Congress is one submitted by the President for the holding of an international exposition in 1924, of products related to mining, metallurgy and nitrate, says R. B. Smith, secretary to the commercial attaché in Santiago.

The exposition is intended to include all lines in any way connected with mining industries, such as power machinery in general, electricity in all its applications, mining machinery, means of communication, explosives, metallurgical processes, chemical industries, products of mines and metallurgy, scientific processes, designs, models, photographs, statistics, etc.

Manufacturers of all countries may enter their products, and public demonstrations and competitive contests will be held.

Cornell Aggie Acquitted in Accidental Injury Charge

The Appellate Division, Third Department, New York Supreme Court, has handed down an interesting decision in a case brought by a student in the Agricultural College, Cornell University, Ithaca, against that institution. Claims for injuries sustained as a result of an explosion in the chemical laboratory while the student was conducting experiments under instructions and with chemicals furnished by the university were made. The explosion resulted in the loss of an eye, and the action for damages covered alleged negligence in not placing competent persons in charge of stock rooms from which a part of the chemicals were secured and in not making proper tests of chemicals before use by students.

In its decision in favor of the college, the court holds that the institution is not liable for the alleged negligence on the part of its officers, as the acceptance of the benefits of the university by the student waived the application of the doctrine of respondent superior. Reference was made to the fact that the college was founded for a charitable purpose, that there was no pecuniary gain therefrom to anyone, the doors being open, under necessary regulations, to the indefinite public; that the payment of tuition by students did not defeat the charitable nature of the university.

Carbon Black Plant to Be Erected at Sarnia, Ont.

Announcement has been made, following a meeting of the board of directors of the Sarnia Oil & Gas Co., that, as a result of permission having been obtained from the government of Ontario to manufacture carbon black from the natural gas controlled by the company, a plant will immediately be erected at the oil and gas fields of the company at Sarnia to manufacture the product. The plant will be the first and only manufactory of carbon black from natural gas in the British Empire. The company is financially controlled by Kitchener, Ont., shareholders.

Increase in Domestic Consumption of Cottonseed Oil and Products

Crop Year Statistics Favorable Despite Drop in Export Business—Visible Supply Down to 365,000 Bbl.

CONSUMPTION of cottonseed oil for the month of July amounted to 163,000 bbl., against 141,000 bbl. the month previous and 136,000 bbl. a year ago. The movement of cottonseed oil into consuming channels during the crop year ended July 31, according to an analysis of the figures on the cottonseed products industry issued by the Bureau of Census on Monday, Aug. 20, amounted to 2,341,000 bbl., which compares with 2,260,000 bbl. in 1922. Considering the high prices that prevailed for cottonseed oil over the greater part of the crop year, traders regarded the showing as favorable. It is estimated that approximately 65 per cent of the oil produced was utilized in the manufacture of lard compound, and in view of the fact that pure lard was comparatively low in price, the vegetable oil product met with rather keen competition.

Export business in cottonseed oil for the 12 months ended July 31 reached the total of 64,469,273 lb., comparing with 85,992,501 lb. for the corresponding period a year ago. Converted into a cooperage basis, the export trade for the crop year amounted to 161,000 bbl., against 215,000 bbl. a year ago. Exporters were unable to compete with the cheaper foreign vegetable oils.

The movement of cottonseed oil into consumption for the crop year, by months, with a comparison, follows:

	1922–23 Bbl.	1921–22 Bbl.
August	168,000	259,000
September	233,500	283,500
October	298,500	233,500
November	273,500	173,500
December	190,000	129,000
January	233,000	192,000
February	194,000	208,500
March	167,000	204,000
April	151,000	109,500
May	128,500	179,500
June	141,000	152,000
July	163,000	136,000
Totals	2,341,000	2,260,000

The visible supply of cottonseed oil on July 31, converting stocks of seed on hand and crude oil on hand into the refined product, was 365,000 bbl., which compares with 434,000 bbl. on the corresponding date a year ago. The visible supply is one of the smallest on record, and should the new crop of cotton move late, operators in most instances hold to the opinion that refiners will experience some difficulty in meeting ordinary trade requirements within the next month or two.

The report was construed as bullish. Latest developments in the cotton belt had more influence upon prices for oil than the Bureau of Census statement. Recent dry weather in Texas has resulted in a general lowering of private estimates on production, and the next official report will, in the opinion of traders, show widespread deterioration. Receipts of cotton seed at the mills for the year ended July 31 amounted to 3,244,960 tons, comparing with 2,923,658 tons a year ago. The amount actually crushed was placed at 3,241,464 tons, as against 3,007,717 tons a year ago.

Production of crude cottonseed oil was placed officially at 1,003,025,212 lb., against 930,474,738 lb. a year ago. Production of refined oil during the crop year reached the total of 910,539,168 lb., against 839,898,417 lb. a year ago.

Cotton seed and cottonseed products statistics for year ended July 31:

	1922–23
Seed received at mills, tons	3,244,960
Seed crushed, tons	3,241,464
Products manufactured:	
Crude oil, lb.	1,003,025,212
Refined oil, lb.	910,539,168
Cake and meal, tons	1,486,861
Stocks, July 31:	
Seed at plants, tons	12,032
Crude oil, lb.	5,036,294
Refined oil, lb.	137,997,813
Exports:	
Oil, lb.	64,469,273
Cake and meal, tons	226,584

Trade Notes

Thomas F. Harvey one of the organizers of the American Chicle Co. and the National Licorice Co., died at his residence in New York City, on Aug. 22.

The New Process Chemical Co. of New York has filed notice of dissolution.

The decree of the United States District Court authorizing the receivers of the Nashville Industrial Corporation to transfer a factory site at the Old Hickory powder plant to the Du Pont Fibre Silk Company for a consideration of $650,000, has been signed.

Business failures in July numbered 522 throughout Italy, compared with 434 in June and 434 in May. This is the largest number of failures in any one month since the war, but it is still below the 1912-14 average of 596 per month.

R. T. Fisher, treasurer of the Corn Products Refining Co., has reached Europe on an inspection tour of the company's interests abroad. He will visit Great Britain, France, Belgium, Holland and Germany.

During the first 6 months of 1923, shipments of linseed oil advanced 32 per cent in quantity and 53 per cent in value, from 1,230,604 lb., with a valuation of $145,135, to 1,633,059 lb., with a valuation of $222,458, or two-thirds the total valuation of the 1922 shipments.

Financial Notes

The United States Finishing Co., Inc., has declared a stock dividend of $1,000,000, bringing the total outstanding capitalization to $7,600,000.

The directors of the American Writing Paper Co. have formed a special committee to draw up plans for providing additional working capital.

The report of the British Dyestuff Corp. for the year ended Oct. 31, 1922, shows a net profit of more than $500,000, as contrasted with a net loss of more than $5,000,000 for the preceding year.

The Fish Rubber Co. reports a surplus of $1,704,209 for the 6 months ended June 30. This is equivalent to $9.57 a share on the outstanding preferred stock, on which accumulated dividends amount to 14 per cent.

Net income of the American Cyanamid Co. for the year ended June 30 was $2,009,957 after charges, taxes, etc. After allowing for preferred dividends, this is equivalent to $25.38 per share on the outstanding common stock.

Officers Nominated for Chemical Salesmen

The nominating committee of the Salesmen's Association of the American Chemical Industry has placed in nomination the following as candidates for the respective offices of the association for the ensuing year: President, Fred E. Signer and Ralph E. Dorland; first vice-president, E. A. McKinnon, A. A. Wassercheid; second vice-president, George A. Bodie, W. H. Adkins; third vice-president, David Stewart, D. C. Blanke; treasurer, George Ashworth, P. M. Dinkins; secretary, A. J. Binder, J. H. Hollywood; executive committee, E. H. Bedell, George Dunning, D. H. Killefer, F. L. Hensler. The election of officers will take place at the annual meeting to be held Sept. 20.

American Institute of Chemistry Plans Corporation

The American Institute of Chemistry is to hold its first fall meeting on Sept. 20. The place is to be Mucci's restaurant, 29 West 48th St. At that time incorporation is planned and other important business is to be transacted. The president of the American Institute, Horace G. Byers, who has been in Europe during the summer making a study of the British Institute, will have matters of interest to place before the members with regard to the conduct of Institute affairs abroad.

It is announced that Lloyd Lamborn, editor of *Chemical Age*., New York, has resigned the secretaryship of the Institute. L. R. Seidell, manager of the New York Testing Laboratories, has taken the position of executive secretary pro tem. His address for the time is Cooper Union, New York City.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Specialties Are Center of Attraction In Chemical Trading

General Inquiry Improving, but Trading Is Light—Steady Undertone to Prices

WITH few exceptions prices for chemicals and allied products are holding on a steady basis. This is indicative of reduced selling pressure and shows that holders of goods have more confidence in the market, although trading is still far from active. Some sellers say that actual business placed last week was less than in the preceding week but there was more inquiry and greatly improved interest on the part of consumers.

The weighted index for the week shows a gain but the advance again was due more to higher levels for associated materials than to any change in important chemicals. As a matter of fact prominent chemicals are featured by a steadiness in price with reports that contract prices in many cases are to be continued at existing levels.

Of interest to the consuming trade was the announcement that makers had revised quotations for less than carlot quantities of soda ash and caustic soda for delivery to points surrounding New York. The contract price for caustic soda is unchanged except that sellers are doing business at $3.16 per 100 lb. instead of the old quotation of $3.16½ per 100 lb.

Among the specialties which received particular attention recently was calcium arsenate. For a few days the market was very excited and buying orders were heavy enough to absorb large stocks of the poison. This buying, however, was not sustained and in the latter part of the week, demand had died down to such an extent that the market was described as quiet. Prices have been irregular throughout the flurry and varied according to seller. Quotations ranged from 13c. to 17c. per lb. Arsenic received more attention while arsenate was selling freely and the price for spot goods was marked up. The shipment price is now higher as cable prices from foreign countries are higher and some domestic producers are waiting to see what is meant by the sudden strength abroad.

Last official figures on imports cover the six month period ending June 30 and a material increase in the inward trade is shown when compared with that of the corresponding period of 1922. Export demand in the current market is described as dull and while this in great part is due to seasonal influences, it is also stated that competition in foreign markets is keen with many American chemicals being undersold by foreign makes.

Jobbing Prices on Soda Ash Revised—Similar Changes in Caustic Soda—Denatured Alcohol Higher — Copper Sulphate Declines — Calcium Arsenate Quieter—Formaldehyde Eases Off — Arsenic Firmer on Shipments—Phosphorus Scarcity Continues — Prussiates Easy.

Acids

Acetic Acid—It is noted from official figures that production of acetate of lime for the first half of the year was larger than for the corresponding period in 1922 and in fact for several years preceding 1922. The larger supply of the raw material has had no weakening effect on the acid and prices for the latter was unchanged with no feature to distinguish present trading. Quotations are $3.38@$3.63 per 100 lb. for 28 per cent; $6.78@$7.13 per 100 lb. for 56 per cent; $9.58@$9.83 per 100 lb. for 80 per cent; $12@$12.78 per 100 lb. for glacial.

Boric Acid—Business is reported to be largely restricted to moderate and small sized lots with an absence of round lot orders. Sellers are keen for business and as stocks are said to be rather large prices are holding easy with open quotations at 10@10½c. per lb. in sacks; 10½@11c. per lb. in bbl.; 11@11½c. per lb. in kegs. These prices apply to both powdered and crystals.

Citric Acid—Very slow call was reported for spot goods and the market was easy. Prices for imported grades were given at 50@51c. per lb., but there was a question regarding the stability of these prices as reports were still current that 49c. per lb. could be done. Domestic was quiet and unchanged at 49@50c. per lb.

Hydrofluoric Acid—Trading is going along in a routine way with nothing to feature the market. Sellers do not look for a heavy consuming call at this time of year and say that the market is in a steady position with no heavy stocks unsold. Prices are quoted at 6@7c. per lb. for 30 per cent; 10@11c. per lb. for 48 per cent; 11@12c. per lb. for 52 per cent; 13@14c. per lb. for 60 per cent.

Muriatic Acid—Not much improvement was reported during the past week. Deliveries against contracts are taking up fair sized lots but new business has not yet opened up appreciably. Prices are said to be low enough to induce trading without buyers holding off for concessions. Quotations are 90c.@$1 per 100 lb. for 1 deg.; $1@$1.10 per 100 lb. for 20 deg.; $1.75@$2 per 100 lb. for 22 deg.

Nitric Acid—The easy tone which has featured the market for several weeks still continues. Buyers are not operating actively and sellers have plenty of stocks to dispose of. The result is that on firm bids quoted prices are disregarded and private terms enter into sales. The asking prices of sellers are $4.50@$5 per 100 lb. for 36 deg.; $4.75 @$5.25 per 100 lb. for 38 deg.; $5@ $5.50 per 100 lb. for 40 deg.; $5.25@ $5.75 per 100 lb. for 42 deg.

Oxalic Acid—Import figures call attention to the fact that shipments of oxalic acid to this country in the first half of the year were unusually large. The competition between domestic and imported is still very keen. Domestic acid is quoted at 12c. per lb. and upwards on a quantity basis. Imported grades are said to have been offered under 12c. per lb., although the latter price is asked.

Tartaric Acid — Although imported grades were openly offered at 34c. per lb. the quotation for domestic offerings was held steady at 36c. per lb. Demand was not up to expectation and total consumption this season is said to have been below the standards of other years. Advices from foreign markets indicate that they are not firm and it is expected that shipment prices will be lowered.

Potashes

Bichromate of Potash—Demand has been very quiet and prices have been easy. No large lots are changing hands but prices are quoted with scarcely any range according to quantity. The inside price of sellers is 10c. per lb. and up to 10¼c. per lb. is asked in some quarters but there is no difficulty in securing goods at the lower level.

Caustic Potash—A firm tone has pervaded the spot market and 7½@7¾c. per lb. is asked by the majority of sellers. Shipments from abroad are

quoted at 7¼c. per lb. but are not attracting much attention. Domestic caustic is unchanged in price. Demand is irregular but producers have sold enough to establish the fact that many consumers will pay a premium to secure a uniform product and be assured of deliveries. Prices for domestic range from 9c. per lb. upward according to quantity, the quotation being f.o.b. producing point.

Permanganate of Potash—Reports on the position of the market vary; some sellers say prices are strong and give 17½c. per lb. as the asking price; others are willing to sell at 17c. per lb. and say that slow buying is preventing the market from advancing. Shipments of imported permanganate are too high to interest buyers, but the bullish significance of high foreign markets is lost because of offerings on the part of domestic makers.

Prussiate of Potash—Red prussiate of potash is quiet and market values are easy not only because of the quiet call for stocks but also because of the lower prices at which shipments can be secured. Spot prices range from 62c. to 65c. per lb. according to seller. Shipments are offered at 59@60c. per lb. Yellow prussiate was quiet during the week. Spot material is offered at 33@34c. per lb. Shipments from abroad are quoted at 29c. per lb. and this tends to destroy interest in the spot market.

Sodas

Acetate of Soda—Only scattered buying has been reported and this material has been relatively quiet throughout the summer. The asking price of producers has been kept at 5½c. per lb. at works but business has been done at 5c. per lb. and it is possible to pick up spot material at the latter figure.

Bichromate of Soda — Attempts to steady prices for this material have been made but consumers are not active at present and selling is keen with the result that buyers generally are able to obtain concessions. Asking prices are generally given at 8c. per lb. but the actual trading basis is said to be 7¼c. per lb. Some of the trades which are large consumers of this material are working into a better position and buying is expected to assume larger proportions with a consequent strengthening of values.

Caustic Soda—For delivery in sections around New York where there is a good consumption of caustic soda in less than car lots, prices on such lots have been revised. The new schedule of prices for those sections quotes 76 per cent solid at $3.80 per 100 lb. for 10 drums and upward; $3.85 per 100 lb. for 5 drums to 9 drums; $4.50 per 100 lb. for 1 to 4 drums. The contract price for caustic is now given at $3.16 per 100 lb. instead of $3.16½ per 100 lb. as previously quoted. Some inquiry is reported for export but prices are a little high to encourage foreign business. Quotations f.a.s. are $3.15@$3.20 per 100 lb. for outside brands and $3.25 @$3.30 per 100 lb. for standard brands.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	169.14
Last week	168.90
Aug., 1918	278.00
Aug., 1919	251.00
Aug., 1920	264.00
Aug., 1921	158.00
Aug., 1922	152.00

Slightly lower prices prevailed for copper sulphate (domestic), formaldehyde and linseed oil, but advances in cottonseed oil and denatured alcohol more than offset the declines and the week's index number is up 24 points.

Nitrate of Soda—The lack of concerted buying for spot and prompt shipment gives an easy feeling and has resulted in reports that sellers would shade prices in order to stir up business. However, sellers for the most part seem satisfied to await developments as they hold that buying is held back by reasons which will shortly disappear and enable buyers to operate actively. At any rate the market is passing through a quiet period. Spot prices are quoted at $2.45 per 100 lb. The schedule of prices for shipments is still unchanged with very little interest at the moment.

Nitrite of Soda—This is one of the chemicals on which the Tariff Commission has conducted investigations but this has had no effect on market conditions. Foreign and domestic makers are in keen competition. Producers quote 7¼c. per lb. at works and importers offer spot goods at 7⅛@7¾c. per lb.

Prussiate of Soda—Sales of imported prussiate were made on spot at 14c. per lb. This shows the market to be easy although most sellers ask 14¼c. per lb. and very little change has taken place during the week. For prompt shipment from abroad 14c. per lb. is quoted. Domestic makers continue to quote 14¼c. per lb.

Miscellaneous Chemicals

Arsenic—A firmer feeling has existed among sellers in arsenic. In the first place the spot market was steadied by the flurry in calcium arsenate probably under the impression that makers of the poison would enter the arsenic market. Real strength to prices was given by reports that export demand had arisen and sales of considerable amounts were said to have been made for shipment to Italy although German firms were the buyers. The quotation for spot is 10@10½c. per lb. Canadian arsenic is offered on shipment at 9½@ 10c. per lb. but other selections are firmer. Some domestic makers will still do 10c. per lb. over the rest of the year but others have withdrawn quotations. Japanese full strength is quoted at 10½c. per lb. and German arsenic is close to 17c. per lb. according to some cables.

Calcium Arsenate—A very active call for arsenate set in a week or more ago and continued for some days with large lots changing hands. Preference was given to stocks held at southern points. Prices varied according to seller but holders were not slow to advance quotations and the prices ranged from 13c. to 17c. per lb. After a few days' activity demand suddenly fell away and in the latter half of last week the market had again become quiet with goods available at 13@14c. per lb.

Bleaching Powder—Competition for business was keen and prices in some directions were unsettled. Paper mills have been absorbing fairly large quantities, but other consumers have shown less buying interest. Prices named during the week ranged from $1.50@ $1.75 per 100-lb., prompt shipment from works.

Copper Sulphate — Domestic producers now quote $5.10@$5.25 per 100 lb., in bbl., immediate shipment, a decline of 15c. from the previous trading level. The metal has been easier and, with business inactive and foreign competition still a factor, prices have been unsettled for some time now.

Calcium Chloride—There was a good call for this material for prompt shipment, but offerings were light and this restricted business, especially so in the granular. First-hands quote $21 per ton on the fused, f.o.b. works, and $27 per ton on the granular. There was some talk in the trade of increased production.

Formaldehyde—The recent slump in buying has eased the market and during the past week offerings came out through first-hands at 13@13½c. per lb. which compares with 14@14½c. a week ago. The decline failed to stimulate buying interest.

Tin Oxide—There was a higher market for the metal, but the advance was not sufficient to change the ideas of sellers of tin oxide. Business was confined to small parcels only. The quotation held at 45c. per lb., bbl. included.

Salammoniac — Domestic producers reported an unchanged market. Foreign material was available at 6@6¼c. per lb., immediate delivery.

Soda Ash—Leading sellers have issued a revised price schedule for less than carlots, covering delivery to points surrounding New York. The new schedule quotes ash packed in bags at $2.10 per 100 lb. for 10 bags or more; $2.15 per 100 lb. for 5 to 9 bags; and $2.35 per 100 lb. for 1 to 4 bags. In barrels the prices are graded similarly, with a premium of 25c. per 100 lb. over the bag price. Large consumers are taking deliveries of ash regularly and business throughout the summer is said to have been the average for the preceding 5 years. Contract prices for light ash are $1.33 per 100 lb. in bulk; $1.45 per 100 lb. in bags, and $1.69 per 100 lb. in barrels. Dense ash is held at $1.42 per 100 lb. in bulk; $1.51 per 100 lb. in bags, and $1.75 per 100 lb. in barrels.

Coal-Tar Products

Trading Inactive—Few Price Changes—Benzaldehyde F.F.C. Lower—Pyridine Scarcity Continues

DEMAND for coal-tar products was inactive. Comparatively few price changes were announced by first hands. In some directions the feeling was easier, but producers did not care to come out with any open price reductions for the major items in the list, believing that the situation would not be bettered by such tactics. Benzene was unsettled on the motor fuel grades, yet this condition was not reflected by any weakness in the industrial distillate. Producers believe that intermediate makers will soon have to come into the market for pure benzene and that just as soon as the buying develops prices will steady. Solvent naphtha continues in light supply and prices named were little more than nominal. Phenol was offered by one producer on the shipment basis of 28c. per lb. Naphthalene was quiet and prices varied according to seller and delivery. Pyridine on spot was scarce and scattered parcels sold through second hands at higher prices. First hands announced a reduction of 15c. per lb. in the price of f.f.c. benzaldehyde. The salicylates closed unchanged, with prices about steady. Slight improvement was reported in the call for H-acid.

Aniline Oil—Trading was inactive. producers held out for 16c. per lb., in drums, carload basis, prompt and nearby shipment from works. Small lots changed hands at 16¼c. per lb.

Aniline Salt—Most holders of spot goods were asking 23c. per lb., but it was admitted that scattered lots sold at slight concessions.

Benzidine — Offerings on spot were moderate and asking prices held around the 80c. level. Some business went through at this figure. The sulphate settled at 75c. nominal.

Benzaldehyde—First hands announced a reduction of 15c. in f.f.c. benzaldehyde, establishing the market at $1.60 per lb. The other grades were unchanged.

Benzene—There was little or no improvement in the situation. The position of the market for motor fuel remains extremely unsettled and this tends to exert pressure on the lower grades of benzene. The inquiry for the pure picked up here and there, but in nearly all instances buyers' views were several cents below the market. Producers hold to the view that the fall period will witness a general revival in the demand for the industrial grades, and in some directions a firmer undertone prevails on contract deliveries. Nominally the market for the 90 per cent grade settled at 25c. per gal., tanks, f.o.b. works, with the pure at 27c. per gal., tanks, f.o.b. works.

Creosote—The domestic market was a featureless affair. Advices from Manchester, England, indicated that foreign markets also underwent no change. Nominal quotations in the U.K. range from 8½@9d. per gal., bulk basis, works.

Cresylic Acid — Prices named here continued to show a wide range. There were sellers of 97 per cent material at 80@90c. per gal., prompt and nearby delivery. On contract the inside figure might have been shaded. Demand was quiet.

H-Acid — Inquiry has improved in some directions and prices of 75@80c. were considered steady.

Dimethylaniline—Producers reported a steady market at 42c. per lb., but second hands offered scattered parcels for immediate delivery at 41c. per lb. Business was described as routine only.

Naphthalene—Demand was slow and prices were unsettled in nearly all quarters. Leading producers continued to quote 7c. per lb. on flake, immediate delivery. Chips could have been picked up for less than 6c. per lb. Chips for nearby delivery were available on the carload basis of 5c. per lb. The market for crude was quotably unchanged. Imported material of good quality held around 2¼c. per lb., c.i.f. New York.

Phenol — U.S.P. phenol, put up in 1-lb. bottles, was lowered 2c. to the basis of 41c. per lb. The market for round lots, in drums, closed unchanged. The undertone remains easy, but traders look for no important price revisions until new production becomes available on a larger scale. One producer held out for 28c. per lb., forward delivery. On spot the prices heard ranged from 29c. to 35c. per lb., as to quantity and seller.

Pyridine—A shipment of 8 drums of pyridine arrived from Antwerp. Spot material was virtually unobtainable and in some directions it was thought that $5 represented the market. On September shipment from the other side there were offerings at $4.25 per gal.

Xylidine—The market was steady, first hands holding out for 50c. per lb., drums included.

Alcohol

An advance of 2c. per gal. was put through late in the week on all grades of denatured alcohol. The uplift reflected improved demand and higher producing costs. Business in denatured usually picks up at this time of the year. Formula No. 1, 190 proof, especially denatured, was revised to the carload basis of 40c. per gal., in drums, and 46c. per gal., in bbl. Formula No. 1, completely denatured, 188 proof, closed at 41c. per gal., in drums, and 47c. per gal., in bbl. Producers of ethyl spirits reported prices as unchanged, but firmer. U.S.P. spirits, 190 proof, held at $4.75 per gal., cooperage included. The position of the market for methanol also underwent no change so far as prices were concerned, leading operators offering the 95 per cent material at $1.18 per gal., with the 97 per cent at $1.20 per gal., in cooperage.

Report on German Coal-Tar Industry

A report has been received from American Trade Commissioner Frederick E. Breithut on the economic aspects of the German coal-tar chemical industry which is being prepared as a trade information bulletin to be issued as a supplement to *Commerce Reports*, and it is hoped that the bulletin will be ready for distribution before the end of this month.

In his opening paragraph Mr. Breithut states his purpose in preparing the report in the following words:

"In facing the problems of home production of coal-tar chemicals and in endeavoring to meet the competition of other nations in the markets of the world, it is essential that American manufacturers should known something about the German coal-tar chemical industry."

The material presented in the report consists of a series of tabulations covering exports, imports and, in some cases, productions of German coal-tar crudes, intermediates and dyes, for the years just before the outbreak of the World War, for the year 1920 and for the first 4 months of 1923, the figures for 1914 to 1919 not being available.

Benzol and its homologues are stressed, some space being devoted to detailing the complete change that has occurred in the benzol industry due to the Ruhr occupation. Statistical data showing imports and exports, listing the more important countries of origin and destination, for naphthalene, anthracene, cresol and phenol, are given.

In the group of intermediates for which data are available in the official reports it is found that aniline oil heads the list from the standpoint of quantity consideration and statistical data covering imports and exports of these, together with naphthol, anthraquinone and others, are mentioned.

Dyes, as might be expected, form the major topic of Mr. Breithut's discussion, there being on this subject statistical tables together with pertinent comment.

Several paragraphs in the original report are devoted to the present status of the German dye industry, and the report concludes with the statement that "German competition in the dye markets of the world will still be a dominant force to be reckoned with, no matter what the final outcome of the French occupation of the Ruhr may be."

Vegetable Oils and Fats

Cottonseed Higher—Spot Linseed Declines—Coconut and Corn Advance—Trading in Menhaden Oil

PRICE changes were more numerous and, with the exception of the drying oils, the tendency was upwards. Inquiry from soap-makers was more of a factor. Lard compound makers were buyers of crude cottonseed and corn oil for immediate and nearby shipment. The July report on cottonseed products was favorable, indicating a healthy movement of refined cottonseed oil into consuming channels. Coconut oil was higher, both here and on the coast. The strength in tallow resulted in a better call for palm oils. Trading was reported in crude menhaden oil. Linseed, soya bean and china wood oils were inactive and prices unsettled.

Cottonseed Oil—The July report on cottonseed products, issued by the Bureau of Census on Monday, Aug. 20, indicated consumption for the last month of the crop year of 163,000 bbl., comparing with 141,000 bbl. a month ago and 136,000 bbl. a year ago. The report was regarded as favorable and served to steady nearby oil. (The statistics are reviewed elsewhere in this issue.) Weather news was a little better than a week ago, but operators in the option market did not care to exert any pressure on the selling end under present uncertain crop conditions. The weekly weather report was anything but favorable and the Department of Agriculture reported poor growing conditions in nearly all sections of the cotton belt. A private estimate came out placing the cotton crop at a little under 11,000,000 bales. Active trading developed in nearby crude and it was estimated that more than 60 tank cars of August-September oil sold at prices ranging from 8¼@8¾c. per lb., f.o.b. Texas common points. Towards the close 8¾c. was asked on August crude in Texas, while bids at 9c. for shipment from the southeast were turned down. Early September shipment settled around 8¼c., with late September nominal at 8¼c. per lb., buyers' tanks, f.o.b. Texas common points. October-November-December crude was merely nominal at 7½c. Bleachable oil was in demand, but scanty offerings restricted business. Bleachable closed at 10¼c. per lb., buyers' tanks, f.o.b. New Orleans, equal to approximately 10¾c., New York. Lard compound held at 12@12¼c. per lb., carload basis, prompt shipment from New York, with demand fair.

Linseed Oil—There was an easier market for oil over the first-half of the week, which was attributed mainly to keen competition for business among crushers. Business showed scanty improvement, but a higher seed market steadied prices towards the close. In the mean time spot oil was lowered from 2@3c. per gal., depending upon the seller and late in the week it was possible to pick up carloads for immediate shipment at 91c. per gal., cooperage basis. September oil closed at 87c. asked, although some business did go through as low as 86c. October settled at 84@85c., with November-April nominal at 80c. per gal., carload basis, cooperage included. Demand has been slow, but this condition is seasonal. Crop prospects in the Northwest are good, despite reports of frost from some isolated sections. Receipts of seed at Minneapolis and Duluth have increased, but demand was active at all times so that the cash position held at a premium over the distant months. September seed at Duluth settled around $2.35 per bu., while December was available at $2.26 per bu. Argentine cables on seed were firmer on covering by shorts; demand from American crushers increased. Cake was dull and unsettled, which tends to steady ideas on future oil contracts.

China Wood Oil—Several parcels of wood oil arrived last week from the Far East. While primary markets continue firm the undertone here is barely steady, because of the lull in trading. Spot oil was offered at 22½@23c. per lb., in bbl. Nearby shipment from the coast settled at 21½c., sellers' tanks.

Coconut Oil — Demand for Ceylon type oil was in evidence and with copra firmer prices were raised about ¼c. per lb. in all directions. Sales went through at 8⅝c. per lb., sellers' tanks, New York. On the coast 7⅞c. was asked on last quarter deliveries, while this price held also on early 1924 contracts. Cebu copra sold at 4½c. per lb., c.i.f. coast, with buyers at the close.

Corn Oil—Sales were reported at 8½c. per lb., tank cars, f.o.b. Chicago, which compares with 7½c. a week ago. The advance in crude cottonseed steadied the market.

Olive Oil Foots—Prime green Italian foots on spot held at 8¾c. asked, with offerings not pressing on the market.

Palm Oils — At the recent decline quite a little business was placed by soapers in the hard palm oils. Niger oil sold during the week at 6½@6⅝c., c.i.f. New York, and towards the close 6¾c. represented the market. Lagos for shipment has advanced to 7½c. per lb. After the uplift demand fell away.

Rapeseed Oil—Refined oil for immediate delivery held at 77c. per gal., with offerings no longer pressing on the market. On futures prices ranged from 73@75c. per gal., as to position. Trading quiet.

Soya Bean Oil—No buying interest developed. There were offerings at 9c. per lb., sellers' tanks, duty paid, f.o.b. New York, with intimation that this figure might be shaded on a firm bid. On futures the coast market was more or less nominal at 8½c. per lb., tank car basis, duty paid, f.o.b. terms.

Menhaden Oil—Makers of soap were recent buyers and it was reported that more than 40 tank cars of crude oil were absorbed within the past week or so, last sales passing at 39c. per gal., f.o.b. factory. Some northern oil sold for export. Fishing was described as poor, due to the stormy weather. Production so far this season has lagged behind compared with a year ago.

Tallow—The sale of 500 drums of extra tallow went through at 7c. per lb., ex plant, an advance of ¼c. Several cars of outside goods, equal to extra, went through at 7¼c. ex plant. At the close, however, 7c. was given as the nominal price on extra, ex-plant.

Oleo Stearine — Last sales went through at 10¼c. per lb., an advance of ¼c. Bids at this figure were reported towards the close. Chicago also reported bids at 10¼c.

Miscellaneous Materials

Casein—Imported was not offered so freely as a short time ago, but with demand slow prices presented an unsettled appearance and there were sellers at 13½@14c. per lb., on low grade material. Domestic casein held at 15@16c. per lb.

Glycerine—The market for crude was a shade easier in some quarters. In the middle-west there were offerings of soap-lye, basis 80 per cent, at 11c. per lb., loose, f.o.b. shipping point. Bids were reported at 10⅞c. Saponification, basis 88 per cent, loose, was offered at 12¼@12½c. per lb. Dynamite glycerine held at 16c. asked, carload lots, but no sales were reported. Chemically pure settled at 17@17½c. per lb., in drums, the inside figure obtaining for carload lots.

Naval Stores—The market was a featureless affair. Turpentine was offered at 96c. per gal. Rosins held at $5.75 per bbl. on the lower grades. Export trade was inactive. The undertone was steady.

Shellac — Firmer primary markets steadied prices and at the close T.N. was held at 58@59c. per lb., an advance of 2c. for the week. Bleached, bonedry, was raised to 70@71c. per lb. Receipts have been light.

Lithopone—Demand was described as satisfactory for this season of the year and producers reported a steady market. Domestic lithopone, in bags, carload lots, closed unchanged at 7c. per lb.

White Lead, etc.—The market underwent no changes, basic materials holding steady, while demand continues at a fairly healthy rate. Pig lead closed unchanged at 6½c. per lb., New York. Standard dry white lead was offered by producers at 9¼c. per lb., in casks, carload lots, with buyers protected against decline. The sulphate was available at 8¾c. per lb. Dry red lead closed at 10½c. per lb., in casks. Litharge held at 10⅜c. per lb.

Imports at Port of New York

August 17 to August 23

ACIDS—Cresylic—1 pkg., Rotterdam, Lunham & Moore. **Tannic**—50 cs. Liverpool, Brown Bros. & Co. **Tartaric**—58 csk., Bremen, Order.

ALCOHOL — 8 bbl. butyl, Havre, Irving Bank-Col. Trust Co.

AMMONIUM CHLORIDE—50 cs., Liverpool, Wing & Evans.

AMMONIUM CARBONATE — 10 bbl., Liverpool, Brown Bros. & Co.

ANTIMONY OXIDE—295 bg., Shanghai, Banque Belge Pour l'Etranger; 250 cs., Changsha, C. F. Smillie; 200 bg., Changsha, Irving Bank-Col. Trust Co.; 1,150 cs. Hankow Sino Java, Hvg.

ANTIMONY REGULUS — 2,120 cs., Shanghai, Banque Belge Pour l'Etranger; 500 cs., Changsha, Asia Banking Corp.; 1,350 cs., Shanghai, Wah Chang Trading Co.; 300 cs., Shanghai, Order.

ARSENIC—10 bbl., Hamburg, Order; 1 pkg., Cape Town, Davies, Turner & Co.

ASBESTOS—346 bg., Southampton, W. D. Crumpton & Co.

BORATE LIME — 417,350 kilos, Antofagasta, Pacific Coast Borax Co.

BAUXITE — 556,000 kilos, Rotterdam, Bank of America.

BARYTES — 200 bg., Bremen, N. Y. Trust Co.; 300 bg., Genoa, Bankers Trust Co.

BRONZE POWDER—20 cs., Bremen, Gerstendorfer Bros.; 7 cs., Bremen, American Express Co.; 12 cs., Bremen, B. F. Drakenfeld & Co.

CAMPHOR—3 cs., Hamburg, Schering & Glatz.

CINCHONIDINE—10 cs., Rotterdam, R. W. Greeff & Co.

CINCHONA BARK—12 bbl., Rotterdam, Nickells, Rowland Co.

CASEIN—834 bg., Buenos Aires, Irving Bank-Col. Trust Co.; 417 bg., Buenos Aires, Order.

CREOSOTE — 5,000 tons (bulk), Hull, Order.

CHALK — 1,400 bg., Antwerp, Bankers Trust Co.; 200 bg., Antwerp, C. B. Chrystal & Co.; 950 tons, Dunkirk, Taintor Trading Co.; 7 bbl., Antwerp, Order.

CHEMICALS—20 bbl., Bremen, Order; 250 csk., Hamburg, Roessler & Hasslacher Chemical Co.; 5 cs., Southampton, T. Nevin; 250 csk., Rotterdam, Stanley, Doggett, Inc.; 71 pkg., Rotterdam, Order; 100 csk., Marseilles, Pomeroy & Fischer.

CHROME ORE—200 tons, Beira, Asia Banking Corp.

CITRATE LIME — 123 csk., Messina, C. Pfizer & Co.

COPRA—316 bg., Morant Bay, Franklin Baker Co.

COLORS—41 csk. earth, Bremen, Heller & Merz Co.; 250 bg. earth, Leghorn, Reichard, Coulston, Inc.; 180 bg. do., Leghorn, Order; 50 bbl. do., Leghorn, R. J. Waddell & Co.; 100 bg. do., Leghorn, Order; 6 csk. dry, Hamburg, H. R. Zahn; 2 pkg. aniline, Antwerp, Irving Bank-Col. Trust Co.; 23 csk. aniline, Genoa, American Exchange National Bank; 19 csk. do., Genoa, Ackerman Color Co.; 20 csk., Hamburg, P. Uhlich & Co.; 5 bbl. aniline, Genoa, Ladenburg, Thalmann & Co.; 15 bbl. do., Genoa, Irving Bank-Col. Trust Co.; 14 bbl. do., Genoa, American Exchange Nat'l. Bank; 6 bbl. do., Genoa, Order.

CUTCH—1,000 bg., Singapore, Order.

DYESTUFFS—33 pkg., Antwerp, American Aniline Products Co.

FULLERS EARTH—250 bg., Southampton, L. A. Salomon & Bros.

FUSEL OIL—19 dr., Rotterdam, Order; 6 dr., Belfast, Order; 6 dr., Dunkirk, Order.

GAMBIER—525 cs., Singapore, Order.

GLYCERINE—40 dr., Marseilles, Order; 30 csk., Marseilles, Order.

GUMS—128 bg. and 50 cs. copal, Singapore, Chemical National Bank; 114 pkg. damar, Singapore, Order; 150 cs. and 202 bg. damar, Singapore, Order; 100 cs. damar, Batavia, W. Schall & Co.; 1,215 bg. copal, Antwerp Central Union Trust Co.; 409 bg. copal, Antwerp, W. Schall & Co.; 612 bg. copal, Antwerp, Order; 22 cs. copal, Paneh, Central Union Trust Co.; 523 bskt. copal, Macassar, Order; 511 cs. damar, Padang, Order; 262 bg. arabic, Port Sudan, Irving Bank-Col. Trust Co.; 3,674 bg. arabic, Port Sudan, Order; 20 bg. copal, Antwerp, Brown Bros. & Co.

GRAPHITE—500 bg. amorphous, Genoa, Order.

IRON OXIDE — 165 bbl. Malaga, Reichard-Coulston, Inc.; 114 bbl., Malaga, C. J. Osborn Co.; 214 bbl., Malaga, S. L. Libby Corp.; 401 bbl., Malaga, C. K. Williams & Co.; 40 bbl., Malaga, J. M. Ravassa; 17 bbl., Malaga, Order; 23 csk., Liverpool, Reichard-Coulston, Inc.

LOGWOOD — 470,000 lb., Miragoane, Stamford Dyewood Co.; 80,000 lb., Port Au Prince, Stamford Dyewood Co.; 95 bbl. liquid, Cape Haitian Logwood Mfg. Corp.; 1,126 tons, Cape Haitian, Oakes Mfg. Co.

LIME NITRATE — 32 csk., Christiania, Order.

LITHOPONE — 120 bg., Rotterdam, A. Klipstein & Co.

MAGNESITE — 110 bbl., Rotterdam, Speiden, Whitfield Co.

MANGROVE BARK—3,800 bg., Singapore, Order; 5,096 bg., Beira, Bingham & Co.

MAGNESIUM—179 dr. chloride, Hamburg, Innis, Speiden & Co.

MENTHOL—10 cs., Rotterdam, National City Bank; 9 cs., London, Order.

NAPHTHALENE — 993 bg., Rotterdam, Lunham & Moore.

OCHER—546 sk., Marseilles, Reichard-Coulston Inc.

OILS—China Wood—401 cs., Shanghai, Jardine, Matheson & Co.; 630 pkg., Shanghai, Standard Bank of South Africa; 1,200 cs., Shanghai, Order; 265 csk., Hankow, Anderson, Meyer & Co.; 690 tons (bulk), Hankow, Order; 100 dr., Hong Kong, F. A. Cundill & Co.; 84 csk., Hong Kong, Order; 200 dr., Hong Kong, Order; 350 bbl., Hankow, Mitsui & Co. **Coconut**—870 tons (bulk), Order; 874,776 kilos (bulk), Manila, Order. **Cod**—25 csk., St. Johns, R. Badcock & Co.; 10 csk., St. Johns, Bridgetts & Co. **Linseed**—5 bbl., London, Order. **Olive Oil (denatured)**—175 bbl., Bari, National City Bank. **Olive foots**—300 bbl. Naples, Order; 300 bbl., Bari, National City Bank. **Peanut**—100 cs., Hong Kong, Tuck High. **Palm**—24 csk., Liverpool, Niger Co.; 15 csk., Liverpool, Order.

OIL SEEDS — Castor — 40 bg., Port de Paix, Huttlinger & Struller. **Linseed** — 6,705,004 kilos, Rosario, Order; 13,968 bg., Buenos Aires, Order.

POTASSIUM SALTS — 50 bbl. sulphate, Bremen, Potash Importing Corp. of America; 900,000 kilos manure salts, Antwerp, Soc. Comm. Des Potasses D'Alsace; 300 csk. chlorate and 150 csk. perchlorate, Marseilles, C. W. Campbell & Co.; 700 bbl. chlorate, Marseilles, Order; 90 csk. and 53 dr. perchlorate, Antwerp, Hummel & Robinson; 1,000 bg. nitrate, Antwerp, Order.

PYRIDINE—8 dr. Antwerp, H. W. Peabody & Co.

QUEBRACHO — 104 bg., Buenos Aires, M. E. Clarendon & Sons; 4,083 bg., Buenos Aires, Order; 13,566 bg., Buenos Aires, Beekman Withrop.

QUICKSILVER—50 flasks, Vera Cruz, Poillon & Poirier; 300 flasks, London, Order.

QUININE — 4 cs., Rotterdam, R. W. Greeff & Co.; 4 cs., Rotterdam, American Express Co.; 25 cs., Rotterdam, Order.

SHELLAC—324 bg., Southampton, Order; 10 cs., Rotterdam, C. F. Gerlach; 10 cs.; Penang, D. L. Silverman; 108 cs., Bankok, Monod Feller Exp. & Imp. Co.; 30 bg., Hamburg, Irving Bank-Col. Trust Co.

SODIUM SALTS—361 csk. hyposulphite, Marseilles, E. Suter & Co.; 300 csk. hyposulphite, Marseilles, E. M. Sergeant & Co.; 203 bbl. chlorate, Marseilles, E. Suter & Co.; 23 csk. prussiate, Liverpool, H. J. Baker & Bro.; 41,435 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 34,627 bg. nitrate, Tocopilla, Wessel, Duval & Co.; 5,028 bg. nitrate, Christiania, Order; 405 csk. do. Christiania, Order; 11 cs. Metallic, Bergen, Seaboard Nat'l Bank.

STARCH—250 bg., Rotterdam, Order.

TALC—300 bg., Genoa, C. Mathieu.

TARTAR—2 csk., Naples, Atriken Chemical Works; 209 csk., Naples, Tartar Chemical Works; 94 sks., Valencia, C. Pfizer & Co.; 192 sks., Marseilles, Royal Baking Powder Co.; 406 bg., Buenos Aires, Royal Baking Powder Co.

WHITING — 200 bg., Bremen, C. B. Chrystal Co.

WAXES—16 bg. bees, Naples, Order; 53 bg. bees, Rio de Janeiro, London & Brazilian Bank; 13 bg. carnauba, Rio de Janeiro, Order; 37 bg. bees, Havana, N. Y. & Cuba Mail S. S. Co.

ZINC WHITE — 160 csk., Rotterdam, Roessler & Hasslacher Chemical Co.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	63⅜	64
Allied Chem. & Dye	64½	67
Allied Chem. & Dye pfd	107	108
Am. Ag. Chem	11⅞	12
Am. Ag. Chem. pfd	30½	31
American Cotton Oil	5½	7
American Cotton Oil pfd	16½	21½
Am. Drug Synd.	4⅜	4½
Am. Linseed Co	18½	19½
Am. Linseed pfd	37	*38
Am. Smelting & Refining Co.	58	58⅜
Am. Smelting & Refining pfd.	95½	*96
Archer-Daniels Mid. Co., w.i.	25	26
Archer-Daniels Mid. Co., pfd.	90	93
Atlas Powder	53⅜	57
Casein Co. of Am.	*62	*62
Certain-Teed Products	*26	*26
Commercial Solvents "A"	*32	*32
Corn Products	122½	127½
Corn Products pfd	120	*120
Davison Chem.	28⅜	30½
Dow Chem. Co	*42	*45
Du Pont de Nemours	121⅞	124⅜
Du Pont de Nemours db	83⅛	84⅛
Freeport-Texas Sulphur	11½	12⅜
Glidden Co.	*8⅜	*8⅜
Grasselli Chem.	*132	*132
Grasselli Chem. pfd	*105	*105
Hercules Powder	*103	106
Hercules Powder pfd	*103	104
Heyden Chem.	*1⅜	*1⅞
Int'l Ag. Chem. Co	2⅛	2⅞
Int'l Ag. Chem. pfd	7⅜	8
Int'l Nickel	12	13
Int'l Nickel pfd	78½	*79½
Int'l Salt	*89	*89½
Mathieson Alkali	41⅞	43
Merck & Co.	82	*78
National Lead	113⅞	124½
National Lead pfd	112½	*112⅜
New Jersey Zinc	150	152
Parke, Davis & Co.	78½	78½
Pennsylvania Salt	*81	*81
Procter & Gamble	128	128
Sherwin-Williams	28⅜	28⅜
Sherwin-Williams pfd.	102	102
Tenn. Copper & Chem.	8⅜	9¼
Texas Gulf Sulphur	56½	58½
Union Carbide	56½	56⅜
United Drug	*80½	79½
U. S. Industrial Alcohol	47⅜	45⅜
U. S. Industrial Alcohol pfd.	*100	*100
Va.-Car Chem. Co	7⅜	8
Va.-Car Chem. pfd	*22	24⅜

*Nominal. Other quotations based on last sale.

German Chemical Exports

German exports of heavy chemicals in 1922 amounted to 827,856 metric tons, of which 123,000 tons went to the United States, 84,000 tons to the Netherlands, 74,000 tons to Great Britain, 42,000 tons to Belgium and 19,000 tons to Switzerland.

Exports of dyes and dyestuffs totaled 152,774 tons, the largest customers being the Netherlands (20,000 tons), China (19,000 tons), the United States (14,000 tons), Great Britain (9,000 tons) and Austria (8,000 tons). Chemical and pharmaceutical products to the amount of 26,219 tons were exported chiefly to Austria (1,900 tons), the Netherlands (1,700 tons), Czechoslovakia (1,100 tons), Belgium (1,000 tons) and Switzerland (1,000 tons).

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0 25 –	$0.25½
Acid, acetic, 28%, bbl	100 lb.	3.38 –	3.50
Acetic, 56%, bbl	100 lb.	6.75 –	7.00
Acetic, 80%, bbl	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl	100 lb.	12.00 –	12.78
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Boric, bbl	lb.	.10½–	
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.12 –	.14
Gallic, tech	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl	lb.	.11½–	.12
22% tech., light, bbl	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl	lb.	.12 –	.12½
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	11.00 –	12.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl	lb.	.65 –	.70
Tannic, tech., bbl	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.33 –	.34
Tartaric, domestic, bbl	lb.	.36 –	....
Tungstic, per lb	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl	gal.	4.78 –	....
Ethyl, 190 p'f. U.S.P., bbl	gal.	4.75 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1 special bbl	gal.	.46 –	...
No. 1, 190 proof, special, dr.	gal.	.40 –	...
No. 1, 188 proof, bbl	gal.	.47 –	...
No. 1, 188 proof, dr	gal.	.41 –	...
No. 5, 188 proof, bbl	gal.	.45 –	...
No. 5, 188 proof, dr	gal	.39 –	...
Alum, ammonia, lump, bbl	lb.	.03½	.03¾
Potash, lump, bbl	lb.	.03 –	.04½
Chrome, lump, potash, bbl.	lb.	.06 –	.07
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½–	.10
Ammonium carbonate, powd. domestic, bbl	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony Sulpuret, golden	lb.	.19 –	.21
Arsenic, white, powd., bbl	lb.	.10 –	.10½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl	ton	65.00 –	70 00
Barium chloride, bbl	ton	82 00 –	90.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks		.08 –	.08½
Blanc fixe, dry, bbl	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.50 –	1.75
Spot N. Y. drums	100 lb.	2 00 –	2.10
Borax, bbl	lb.	.05½–	05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4 00 –	4 05
Calcium arsenate, dr	lb.	.13 –	14
Calcium carbide, drums	lb.	05½–	05½
Calcium chloride, fused, dr. wks.	ton	21 00 –	....
Gran. drums works	ton	27 00 –	....
Calcium phosphate, mono, bbl	lb.	.06½–	07
Camphor, cases	lb.	86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	09 –	.09½
Chalk, precip.—domestic, light, bbl	lb.	04½–	.04¾
Domestic, heavy, bbl	lb.	03½–	03¾
Imported, light, bbl	lb.	.04½–	.05
Chlorine, liquid, tanks, wks	lb.	05½–	05½
Cylinders, 100 lb., wks	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl	lb.	2 10 –	2 25
Copperas, bulk, f.o.b. wks	ton	20 00 –	21.00
Copper carbonate, bbl	lb.	.18 –	.19
Copper cyanide, drums	lb.	.47 –	50
Copper sulphate, dom., bbl.,	100 lb.	5.10 –	5 25
Imp. bbl	100 lb.	4.60 –	4 65
Cream of tartar, bbl	lb.	.24½–	.26
Epsom salt, dom., tech., bbl	100 lb.	1 75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	>0 –	1.00
Epsom salt, U.S.P., dom., bbl	100 lb.	2.25 –	2 50
Ether, U.S.P., resale, dr	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81
Ethyl acetate, ether, 98% to 100%	gal.	$0.95 –	$1.00
Formaldehyde, 40%, bbl	lb.	.13 –	.13½
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	.... –	....
Fusel oil, crude, drums	gal.	4.00 –	4.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, e.p., drums extra	lb.	.17 –	.17½
Glycerine, dynamite, drums	lb.	.16 –	....
Glycerine, crude 80%, loose	lb.	.11 –	....
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½–	.09½
White, basic sulphate, casks	lb.	.08½–	.09
White, in oil, kegs	lb.	.11½–	.11½
Red, dry, casks	lb.	.10½–	.10½
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl	lb.	.18 –	.20
Lime-Hydrated, bg, wks	ton	10.50 –	12.50
Bbl., wks	ton	18.00 –	19.00
Lime, Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.10½
Lithophone, bags	lb.	.07 –	.07½
in bbl	lb.	.07½–	.07½
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl	gal.	1.18 –	1.20
Methanol, 97%, bbl	gal.	1.20 –	1.22
Methyl-acetone, t'ks	gal.	1.15 –	....
Nickel salt, double, bbl	lb.	.10½–	....
Nickel salts, single, bbl	lb.	.11½–	....
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.10 –	....
Potassium bromide, gran., bbl	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06¾
Potassium chlorate, powd	lb.	.07 –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.07½	.08
Potassium hydroxide (caustic potash) drums	lb.	.07½–	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl	lb.	.06½–	.07½
Potassium permanganate, drums	lb.	.17 –	.17½
Potassium prussiate, red, casks	lb.	.62 –	.65
Potassium prussiate, yellow, casks	lb.	.33 –	....
Salammoniac, white, gran., casks, imported	lb.	.05½–	.06
Salammoniac, white, gran., b l., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl	100 lb.	1.20	1 40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.45 –	1.50
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.70 –	1.75
Soda ash, dense, bags, contract, basis 58%	100 lb	1.51 –	....
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums	100 lb.	3.16 –	....
Soda, caustic, ground and flake, contracts	100 lb.	3.60 –	3 85
Soda, caustic, solid, 76% f. a. s. N. Y	100 lb.	3.15 –	3 25
Sodium acetate, works, bags	lb.	.05½–	.05¾
Sodium bicarbonate, bbl	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.07¾–	.08
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl	lb.	.04½–	04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22½
Sodium fluoride, bbl	lb.	$0.08½–	$0.10½
Sodium hyposulphite, bbl	lb.	.02½–	.03
Sodium nitrite, casks	lb.	.07½–	.07½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.14 –	.14½
Sodium salicylic, drums	lb.	.40 –	.45
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.04
Sodium sulphite, crys., bbl	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.10 –	.11
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2 35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl	lb.	.11½–	.12
Tin oxide, bbl	lb.	.45 –	....
Tin crystals, bbl	lb.	.30½–	.31
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl	lb.	.06½–	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½–	....
French, green seal, bags	lb.	.10½–	....
French, white seal, bbl	lb.	.12 –	....
Zinc sulphate, bbl	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl	lb.	.68 –	.80
Alpha-naphthylamine, bbl	lb.	.34 –	36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.80 –	.85
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.c. drums	lb.	1.60 –	....
tech, drums	lb	75	....
Benzene, pure, water-white, tanks nd drums	gal.	.27 –	.32
Benzene, 90%, tanks & drums	gal.	.25 –	.30
Benzidine base, bbl	lb.	.80 –	.85
Benzidine sulphate, bbl	lb.	.75 –	....
Benzoic acid, U.S.P., kegs	lb.	.75 –	80
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	....
Benzyl chloride, tech., drums	lb.	.30 –	.35
Beta-naphthol, tech., bbl	lb.	.22 –	.23
Beta-naphthylamine, tech	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.85 –	.90
95-97%, drums, works	gal.	.75 –	.80
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.41 –	.42
Dinitrobenzene, bbl	lb.	.19 –	.20
Dinitrochlorbenzene, bbl	lb.	.21 –	.22
Dinitronaphthalen, bbl	lb.	.30 –	.32
Dinitrophenol, bbl	lb.	.35 –	.40
Dinitrotoluen, bbl	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl	lb.	.50 –	.52
H-acid, bbl	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl	lb.	.07 –	.07½
Naphthalene, balls, bbl	lb.	.07½–	.07¾
Naphthionate of soda, bbl	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14½
N-W acid, bbl	lb.	1.25 –	1 30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl	lb.	1.20 –	1 30
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl	lb.	.14 –	.15
Para-amifiophenol, base, kegs	lb.	1.35 –	....
Para-amifiophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl	lb.	.17 –	.20
Paranitroaniline, bbl	lb.	.70 –	.74
Para-nitrotoluene, bbl	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl	lb.	.35 –	.38
Phenol, U.S.P., dr	lb.	.29 –	.35
Picric acid, bbl	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$4.75 –	$5.00
Resorcinol, tech., kegs	lb.	1.40 –	1.50
Resorcinol, pure, kegs	lb.	2.25 –	
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.32 –	
Salicylic acid, U.SP., bbl.	lb.	.35 –	
Solvent napthha, water-white, tanks	gal.	.27 –	
Crude, tanks	gal.	.24 –	
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.32
Toluene, drums	gal.	.34 –	.36
Xylidine drums	lb.	.50 –	
Xylene, pure, drums	gal.	.60 –	.65
Xylene, com., drums	gal.	.34 –	
Xylene, com., tanks	gal.	.29 –	

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.75 –	$5.80
Rosin E-I, bbl.	280 lb.	5.90 –	
Rosin K-N, bbl.	280 lb.	5.90 –	6.15
Rosin W.G.-W.W., bbl.	280 lb.	6.50 –	7.25
Wood rosin, bbl.	280 lb.	5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	.96 –	
Wood, steam dist., bbl.	gal.	.75 –	
Wood, dest. dist., bbl.	gal.	.60 –	
Pine tar pitch, bbl.	200 lb.	–	6.00
Tar, kiln burned, bbl.	500 lb.	–	12.00
Retort tar, bbl.	500 lb.	–	11.50
Rosin oil, first run, bbl.	gal.	.40 –	
Rosin oil, second run, bbl.	gal.	.45 –	
Rosin oil, third run, bbl.	gal.	.50 –	
Pine oil, steam dist.	gal.	.70 –	
Pine oil, pure, dest. dist.	gal.	.65 –	
Pine tar oil, ref.	gal.	.48 –	
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	–	.75
Pine tar, ref., thin, bbl.	gal.	–	.25
Pinewood creosote, ref., bbl.	gal.	–	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04 –	$0.04½
Grease yellow, bbl.	lb.	.06 –	.06½
Lard oil, Extra No. 1, bbl.	gal.	.86 –	.88
Neatsfootoil 20 deg. bbl.	gal.	1.20 –	1.25
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine		.10½ –	
Red oil, distilled, d.p. bbl.	lb.	.09 –	
Saponified, bbl.	lb.	.09 –	
Tallow, extra, loose	lb.	.07 –	.07½
Tall-w oil, acidless, bbl.	gal.	.82 –	.84

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13 –	
Castor oil, No. 1, bbl.	lb.	.13½ –	
Chinawood oil, bbl.	lb.	.22½ –	.23½
Coconut oil, Ceylon, bbl.	lb.	.09½ –	
Ceylon tanks, N.Y.	lb.	.08½	
Coconut oil, Cochin, bbl.	lb.	.09½ –	
Corn oil, crude, bbl.	lb.	.09½ –	
Crude, tanks, (f.o.b. mill)	lb.	.08½ –	.08½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½ –	
Summer yellow, bbl.	lb.	.11 –	
Winter yellow, bbl.	lb.	.12 –	
Linseed oil, raw, car lots, bbl.	gal.	.91 –	
Raw, tank cars (dom.)	gal.	.86 –	
Boiled, cars, bbl. (dom.)	gal.	.93 –	
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08½ –	.08½
Palm, Lagos, casks	lb.	.07½ –	
Niger casks	lb.	.06½ –	
Palm kernel, bbl.	lb.	.08½ –	.08½
Peanut oil, crude, tanks (mill)	lb.	.10½ –	
Peanut oil, refined, bbl.	lb.	.13½ –	.14
Perilla, bbl	lb.	.15½ –	.15½
Rapeseed oil, refined, bbl.	gal.	.77 –	
Rapeseed oil, blown, bbl.	gal.	.82 –	
Sesame, bbl.	lb.	.11½ –	.11½
Soya bean (Manchurian), bbl.	lb.	.10 –	
Tank, f.o.b. Pacific coast	lb.	.08½ –	
Tank, (f.o.b. N.Y.)	lb.	.08½ –	.09

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.63 –	
Menhaden, light pressed, bbl.	gal.	.65 –	
White bleached, bbl.	gal.	.68 –	
Blown, bbl.	gal.	.72 –	
Crude, tanks (f.o.b. factory)	gal.	.39 –	.40
Whale No. 1 crude, tanks, coast	lb.	–	
Winter, natural, bbl	gal.	.76 –	.78
Winter, bleached bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$26.00 –	$28.00
Copra, sun dried, bags, (c.i.f.)	lb.	.04½ –	.04½
Sun dried Pacific coast	lb.	.04½ –	.04½
Cottonseed meal, f.o.b. mills	ton	34.00 –	
Linseed cake, bags	ton	33.00 –	
Linseed meal, bags	ton	36.00 –	

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	1.00 –	1.05
Cochneal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½ –	.04
Cutch, Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags	100 lb.	3.79 –	4.06½
Dextrine gum, bags	100 lb.	4.14 –	4.34
Divi-divi, bags	ton	38.00 –	39.00
Lustic, sticks	ton	30.00 –	35.00
Lustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	26.00 –	30.00
Fogwood, chips, bags	lb.	.02½ –	.03½
Sumac, leaves, Sicily, bags	ton	78.00 –	80.00
Sumac, ground, bags	ton	$72.00 –	$75.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags	100 lb.	3.22 –	3.49
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, conc., bbl.	lb.	$0.18 –	$0.22
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.17 –	.18
Logwood, liq., 51°, bbl.	lb.	.08½ –	.09
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.17 –	$0.21
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.50 –	.55
Prussian, bbl.	lb.	.50 –	.55
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl	lb.	.32 –	.34
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.28 –	.30
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.20 –	1.25
Yellow, Chrome, C.P. bbls	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.28 –	$0.29
Beeswax, crude, bags	lb.	.21 –	.26
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.22 –	.23
Carnauba, No. 1, bags	lb.	.42 –	.42½
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.17½ –	.17½
Japan, cases	lb.	.15½ –	.16
Montan, crude, bags	lb.	.05 –	
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	.04¼
Crude, scale 124-126 m.p., bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03½ –	
Ref., 125 m.p., bags	lb.	.03½ –	
Ref. 128-130 m.p., bags	lb.	.03½ –	
Ref., 133-135 m.p., bags	lb.	.04½ –	.04½
Ref., 135-137 m.p., bags	lb.	.05½ –	.05½
Stearic acid, agle pressed, bags	lb.	.12½ –	.12½
Double pressed, bags	lb.	.12½ –	.13
Triple pressed, bags	lb.	.14 –	.14½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works	100 lb.	$3.20 –	$3.25
F.a.s. double bags	100 lb.	3.50 –	3.55
Blood, dried, bulk	unit	4.00 –	
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks.	unit	3.75 –	
Nitrate of soda, bags	100 lb.	2.45 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.60 –	3.75
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	34.55 –	
Potassium sulphate, bags basis 90%	ton	43.67 –	
Double manure salt	ton	25.72 –	
Kainit	ton	7.22 –	

Crude Rubber

Para—Upriver fine	lb.	$0.28½ –	
Upriver coarse	lb.	.23½ –	
Upriver caucho ball	lb.	.25 –	
Plantation—First latex crepe	lb.	.29½ –	
Ribbed smoked sheets	lb.	.29½ –	
Brown crepe, thin, clean	lb.	.28 –	
Amber crepe No. 1	lb.	.28½ –	

Gums

Copal, Congo, amber, bags	lb.	$0.12½ –	$0.13½
East Indian, bold, bags	lb	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.28 –	.28½
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.23½ –	.24
Kauri, No. 1, cases	lb	.68 –	.70
Ordinary chips, cases	lb	.23 –	.24
Manjak, Barbados, bags	lb	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.61 –	$0.62
Orange superfine bags	lb	.63 –	.64
A. C. garnet, bags	lb.	.59 –	
Bleached, bonedry	lb.	.70 –	.71
Bleached, fresh	lb.	.58 –	.59
T N., bags	lb.	.58 –	.59

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$375.00 –	$500.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$55.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	10.00
Casein, bbl., tech.	lb.	.13½ –	.15½
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.50 –	
No. 2 pottery	long ton	6.00 –	
No. 1 soap	long ton	8.50 –	
No. 1 Canadian, f.o.b. mill	long ton	18.00 –	20.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	06½
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.15 –	.15½
Gum tragacanth, sorts, bags	lb	.50 –	.55
No. 1, bags	lb.	1.50 –	1.60
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl	lb.	.05 –	.05½
Dom., ground, bbl	lb.	.05½ –	.06
Silica, glass sand, f.o.b Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, glass sand, f.o.b Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 –	9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	18.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 –	
Corning	bbl.	1.60 –	
Cabell	bbl.	1.50 –	
Somerset	bbl.	1.40 –	
Illinois	bbl.	1.67 –	
Indiana	bbl	1.68 –	
Kansas and Oklahoma, 28 deg.	bbl.	1.20 –	
California, 35 deg. and up	bbl.	1.04 –	

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.19½ –	
Naphtha, V. M. & P. deod, steel bbls	gal	.18½ –	
Kerosene, ref. tank wagon	gal.	.14 –	
Bulk, W. W. export	gal.	.06½ –	
Lubricating oils:			
Cylinder, Penn., dark	gal.	.20 –	.22
Bloomless, 30@31 grav.	gal.	.18 –	
Paraffin, pale	gal.	.26 –	.27
Spindle, 200, pale	gal.	.20 –	.21
Petrolatum, amber, bbls.	lb.	.04½ –	
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140-145
Chrome brick, f.o.b. Eastern shipping points	ton	50-52
Chrome cement, 40-50% Cr_2O_3	ton	23-27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	45-47
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	41-43
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65-68
9-in. arches, wedges and keys	ton	80-85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	53-55
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	53-55
F.o.b. Mt. Union, Pa.	1,000	45-47
Silicon carbide refract brick, 9-in	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb	.07 –	.08
4-6% C	lb.	.10 –	.12
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	117.50 –	
Spiegeleisen, 19-21% Mn.	gr. ton	45.00 –	47.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-15%	gr. ton	43.00 –	50.00
50%	gr. ton	85.00 –	
75%	gr. ton	135.00 –	155.00

Ferrotungsten, 70–80%, per lb. of W	lb.	$0.88 @ $0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	3.50 – 4.50
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 – 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 – 23.00
C.i.f. Atlantic seaboard	ton	21.00 – 25.00
Coke, fdry., f.o.b. ovens	ton	5.25 – 5.75
Coke, furnace, f.o.b. ovens	ton	4.50 – 4.75
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 – .....
Ilmenite, 52% TiO_2	lb.	.01½– .01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.35 –.....
Manganese ore, chemica (MnO_2)	ton	80.00 – 85.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 – .70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, dom. fines, f.o.b. mines, Ga	unit	.12 –.....
Rutile, 95% TiO_2	lb.	.12 –.....
Tungsten, scheelite, 60% WO_3 and over	unit	8.75 – 9.00
Tungsten, wolframite, 60% WO_3	unit	8.50 – 8.75
Uranium ore (carnotite) per lb of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 – 2.50
Vanadium pentoxide, 99%	lb.	12.00 – 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 – 1.00
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.02 – .10

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	13¼- 13¾
Aluminum, 98 to 99%	26–27½
Antimony, wholesale, Chinese and Japanese	7¾- 8¼
Nickel, virgin metal	27–29
Nickel, ingot and shot	30–32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	40.00
Lead, New York, spot	6.50
Lead, E. St. Louis, spot	6.45
Zinc, spot, New York	6.85
Zinc, spot, E. St. Louis	6.50

Other Metals

Silver (commercial)	oz.	$0.63
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	64.00–65.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	22 75
Copper bottoms	31.50
Copper rods	23 00
High brass wire	20 25
High brass rods	18 00
Low brass wire	21.75
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	28.50
Seamless copper tubing	27 00
Seamless brass tubing	25.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.25@ 9.50
Copper, heavy and wire	11 25@11.50
Copper, light and bottoms	10.25@10 50
Lead, heavy	5.25@ 5 50
Lead, tea	3 25@3 37½
Brass, heavy	6.25@ 6 50
Brass, light	5.25@ 5 50
No. 1 yellow brass turnings	6 00@ 6.25
Zinc scrap	3 50@ 3.75

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.64	$3.64
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

California

LIVERMORE—The Oso Products Co., 1053 Mission St., San Francisco, manufacturer of soap products, has leased a 1-story plant to be erected by George Beck, J. St., Livermore, on Chestnut St., near M St., for its proposed local works, estimated to cost $13,000, exclusive of equipment. E. F. Wells is president.

LOS ANGELES—The California Tube & Tire Co. Baker-Detwiler Bldg., recently organized with a capital of $1 500,000, is perfecting plans for the erection of a new local plant for the manufacture of tubes and tires. The initial works will consist of two units, one to be used for tube manufacture and the other for tire production, estimated to cost $750,000, with machinery. The new company is affiliated with the Chillicothe Tire & Rubber Co., Chillicothe, O., and S. S. Wortley, vice-president of the latter organization, will be an official; Melville Dozier, Jr., will be president.

LOS ANGELES—The Acme White Lead & Color Works, Inc., has awarded a contract to H. M. Baruch, I. W. Hellman Bldg., for the erection of a 1-story plant on Alosta St., near Ezra St., 160x200 ft., estimated to cost $60,000. Swasey & McAfee, Hibernian Bldg., are architects.

FULLERTON—Surveys are under way and ground will soon be broken for the new local plant of the Clay Products Co., California Hotel Bldg., estimated to cost about $90,000. It is purposed to have the first unit ready for service late in Oct., and to build additional units shortly thereafter. George R. Whitcomb is president.

GRIDLEY—The Valley Concrete Pipe Co., Yuba City, has acquired the local plant of James F. King, manufacturing a kindred line of products, and will take over the property. Extensions and improvements are under consideration. Gordon Williams is manager.

MERCED—The Yosemite Portland Cement Co. has taken title to a tract of 145 acres of land about 1 mile from the city as a site for its proposed manufacturing plant, to cost approximately $1,000,000. Leigh Hunt, Kansas City, Mo., is engineer. C. S. Woody is vice-president and treasurer.

SAN FRANCISCO — The Stanard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, etc., will soon take bids for the erection of a 5-story works at 9th and Brannan Sts., 100x180 ft., for which plans have been completed by Weeks & Day, 315 Montgomery St., San Francisco, architects.

Illinois

CLEARING—Bids are being taken by the George H. Morrill Co., 157 West Harrison St., Chicago, manufacturer of printing and other inks, for the erection of the initial unit of its proposed local plant, comprising a 1-story building, 40x250 ft., and 2-story structure, 40x62 ft. Foltz & Brand, 111 West Washington St., are architects.

CHICAGO—The Wolff Mfg. Co., 225 North Hoyne Ave., manufacturer of porcelain and porcelain-lined plumbing fixtures, has acquired the plant and property of the James A. Brady Foundry Co. Western Ave. and 45th St., totaling about 4 acres, and will use for expansion. It was secured for a consideration stated at $300,000. Plans are being arranged for improvements in the existing buildings and the erection of new structures, estimated to cost $500,000, with machinery. It is purposed to develop an initial output of about 900 porcelain bath-tubs and other fixtures per day.

Indiana

SUMMITVILLE—The Crystal Chemical Co. is planning for the rebuilding of the portion of its plant destroyed by fire Aug. 13, with loss reported at $12,000, including equipment.

PETERSBURG—The Board of Works is considering tentative plans for the installation of a filtration plant at the municipal waterworks, estimated to cost $35,000.

HOAGLAND—Fire, Aug. 8, destroyed a portion of the plant of L. P. Hartzell, manufacturer of tile products, with loss estimated at $25,000. It is planned to rebuild.

MARION—The plant and property of the Black Panther Oil & Refining Co., has been purchased by James Arnold, Decatur, Ind., at a receiver's sale. The new owner is said to be planning for a reorganization of the company, and the operation and expansion of the property.

Kentucky

LOUISVILLE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron plumbing fixtures, etc., has construction in progress on a 1-story addition to its local foundry on Shipp St., 100x150 ft., estimated to cost $100,000, with equipment. D. X. Murphy & Brothers, Louisville Trust Bldg., are architects.

Louisiana

OPELOUSA—The Opelousa Cotton Oil Co. has preliminary plans under way for extensions and improvements in its plant to cost about $65,000, including equipment.

MONROE—The Owens Bottle Co., Toledo, O., has acquired a local site of about 40 acres of land and will soon break ground for the erection of a new glass bottle and container manufacturing plant consisting of a number of plant units, estimated to cost close to $1,000,000, with machinery. The works include a power plant.

MONROE—The Union Oil Mill Co., recently formed with a capital of $150,000, has purchased the plant and property of the American Cotton Oil Co., in the West Monroe district, and will take immediate possession. Plans are being considered for extensions and improvements, including the installation of additional equipment.

BASTROP—The Brown Cotton Oil Co. has tentative plans under advisement for extensions and betterments in the plant of the Osage Cotton Oil Co., recently acquired, for increased production. The company has been organized with a capital of $50,000. J. H. Harrington is general manager.

Maryland

HAVRE DE GRACE—The Tiger Tire & Rubber Corp., 749 Equitable Bldg., Baltimore, recently formed with a capital of $1,000,000, as a subsidiary of the Tiger Tire Co. a Canadian organization, has purchased a local tract of land for the erection of a new plant for the manufacture of automobile tires, estimated to cost close to $200,000. It will have an initial output of 300 tires per day and this will be increased at an early date. Horace H. Hastings president of the Canadian company, heads the new organization; Edward Fetter is also an official.

HAGERSTOWN—The Eastern Brick & Sewer Pipe Co., lately organized with a capital of $350,000, has acquired local property on the Opequon River as a site for a new plant for the manufacture of clay sewer pipe, tile, etc., estimated to cost approximately $125,000, with equipment.

Massachusetts

QUINCY—Eustis Pennick & Co., 10 Post Office Sq., Boston, manufacturers of starch products, has awarded a contract to the Whidden Beekman Co., 10 Boylston St., Boston, for the erection of a new plant at 115-21 Old Colony Ave., Quincy, consisting of a main factory and two adjoining structures, estimated to cost about $50,000.

Michigan

DETROIT—In connection with an expansion program inaugurated several months ago, involving about $5,000,000, Dodge Brothers, Inc., Joseph Campau Ave.,

manufacturer of automobiles, has plans for the erection of a new cyanide plant unit, to cost in excess of $200,000.

Missouri

SEDALIA—The Board of Education will install a chemical laboratory in the new 3-story high school, 185x190 ft., estimated to cost $400,000, to be erected on selected site. Bids will be asked during September. T. W. Bast, Sedalia, is architect; William B. Ittner, Board of Education Building, St. Louis, is consulting architect.

New Jersey

NEWARK—The Celluloid Co., 290 Ferry St., will commence the erection of an addition to its plant at 94 Paris St., to cost about $25,000. Plans have been filed.

FORDS—Fire, Aug. 16, damaged a portion of the plant of the Seaboard Refractories Co., Raritan Township, near Fords, with loss estimated at $25,000. It is planned to rebuild.

New York

COHOES—The Mohawk Paper Makers, Inc., Saratoga St. and the Kings Canal, Waterford, N. Y., has tentative plans under consideration for extensions and improvements in its plant at Cohoes, including the installation of additional equipment for increased output.

BUFFALO—The du Pont Cellophane Co., recently organized by officials of the du Pont Fiber Silk Co., River Road, has acquired property adjoining the works of the parent organization for the erection of a new plant for the manufacture of transparent papers, produced under a special process from cellulose. Construction will be commenced on a number of plant units to cost in excess of $1,000,000, with machinery. L. A. Yerkes, president of the parent company, heads the new organization. Both companies are operated by E. I. du Pont de Nemours & Co., Wilmington, Del.

Ohio

CHILLICOTHE—The Buckeye Tile Co. has work in progress on a new plant on Washington St., and purposes to commence operations early in the fall. The works will be devoted to fine ceramic tile and mosaics in different colors, and will give employment to more than seventy-five operatives. This working force will be increased at an early date. J. E. Hysell is general manager.

EAST PALESTINE—In addition to the construction of a new five-kiln plant addition, now under way, the W. S. George Pottery Co., manufacturer of general ware, is making extensions and improvements in its present works, including the installation of additional equipment in the decorating and other departments for considerable increased output.

Oklahoma

PICHER—Sparks & Rains, Galena, Kan., are planning for the rebuilding of the portion of the milling plant at its local mining properties, recently destroyed by fire with loss estimated at $90,000 including equipment.

Pennsylvania

MOUNT UNION—Fire, Aug. 10, destroyed a portion of the plant of the Mount Union Tanning & Extract Co., with loss estimated at $50,000, including equipment. It is planned to rebuild.

ROULETTE—The Roulette Glass Co., Corning, N. Y., recently organized, is reported to be perfecting plans for the erection of its proposed new plant on local site, estimated to cost $300,000, with machinery. G. S. Goff, Corning, is president.

WARREN—Fire, Aug. 16, destroyed a portion of the plant of the Elk Tanning Co., with loss approximating $50,000, including buildings and equipment. The works have been inactive for several months, and recently were purchased by H. A. Logan. Rebuilding is said to be under consideration.

NORRISTOWN—The plant and equipment of the Peerless Mfg. Co., manufacturer of paper products, have been acquired by Albert Wilson, Lewis Rossiter and Isaac Sheppard, who will take possession. The company will be reorganized and expanded, including proposed plant improvements and extensions. Mr. Rossiter will be president of the new company, and Mr. Wilson, treasurer.

Tennessee

MEMPHIS—The Plough Chemical Co. has tentative plans for the erection of a new plant, estimated to cost in excess of $400,000, including equipment. The company has recently increased its capital from $2,500,000 to $7,500,000 for expansion. Abraham Plough is president.

Texas

RANGER—The Interstate Refineries Corp., Kansas City, Mo., has acquired the local plant of the Ranger Refining & Pipe Line Co., as well as the branch works at Kansas City, for a consideration stated at $300,000. The Ranger plant has been closed for about 24 months. The new owner will take immediate possession and plans for extensions and improvements, including the installation of gasoline-refining equipment, estimated to cost close to $100,000.

DALLAS—The Texas Corrugated Box Co., recently organized, has work in progress on a new plant in the Love Industrial district for the manufacture of corrugated boxes and containers, estimated to cost $100,000, including machinery. Wood pulp and straw pulp will be secured from Bogaloosa and New Iberia, La., where affiliated mills will be operated. J. H. Oppenheim heads the new organization; Walter Liebman and H. Z. Schmidt will be officials of the company.

West Virginia

NEW CUMBERLAND—Fire, Aug. 15, destroyed a portion of the plant of the New Cumberland Glass Co., with loss estimated at $30,000, including equipment. The works specialized in the manufacture of chimneys and other hollowware, giving employment to 100 men. It is planned to rebuild.

PADEN CITY—The Paden City Pottery Co., manufacturer of general ware, has tentative plans for extensions and improvements, including the installation of additional equipment, for increased output. Charles Harris is general manager.

New Companies

PAYNTAR ANILINE WORKS, INC., Newark, N. J.; chemicals, dyes, etc.; 1,000 shares of stock, no par value. Incorporators: William Gordon and Morris Krugman, 437 Riverside Ave., Newark. The last noted is representative.

GALLOWAY OIL CORP., Dover, Del.; refined oil products; $10,000,000. Representative: Arley B. Magee, Dover.

AMERICAN CROSS CHEMICAL CO., Birmingham, Ala.; organized; chemicals and chemical compounds. W. H. Paxton and C. L. Montgomery, both of Birmingham, head the company.

P. L. SMELTING & REFINING CO., Brooklyn, N. Y.; refined metals; $10,000. Incorporators: P. Cashman, R. Levy and C. Doris. Representative: Abraham L. Doris, 233 Broadway, New York.

DIVERSEY MFG. CO., Room 1414, 53 West Jackson Blvd., Chicago, Ill.; chemicals and chemical byproducts; $20,000. Incorporators: William H. Noble, Ernest O. Best and Fletcher Lewis.

WAVERLY SMELTING & CHEMICAL CO., Newark, N. J.; chemicals and affiliated products; $125,000. Incorporators: Walter A. Beers and Edward A. Schilling, 763 Broad St., Newark. The last noted is representative.

DENMARK OIL MILL, INC., Denmark, S. C.; cotton oil products; capital stock not stated. J. A. Wiggins is president, and F. V. James, secretary and treasurer, both of Denmark.

BLUE RIBBON OIL REFINERIES CO., Wilmington, Del.; refined petroleum products; $400,000. Representative: Corporation Service Co., Equitable Bldg., Wilmington.

PORBORG-DEMOOR, INC., New York, N. Y.; vegetable and other oils; $50,000. Incorporators: M. Chonack, H. Ehrick and W. S. Tienken. Representative: Herman & Ernst, 170 Broadway, New York.

AMERICAN SULPHUR & FERTILIZER CO., Oklahoma City, Okla.; $500,000; fertilizers, sulphur and affiliated products; $500,000. Incororators: J. A. Price, C. W. Jones, Dallas, Tex.; and J. H. Turner, Oklahoma City.

STANDARD INDUSTRIAL CO. OF NEW ENGLAND, Boston, Mass., denatured alcohol and kindred products; $50,000. Daniel J. Murphy, president; and John E. Feely, 286 South St., Jamaica Plain, Mass., treasurer and representative.

CRYSTEL CHEMICAL CORP., Pittsburgh, Pa.; chemicals and chemical byproducts; $50,000. Representative: Capital Trust Co. of Delaware, Dover, Del.

GEORGE F. RUBY, INC., 9 North Wabash Ave., Chicago, Ill.; enamels, bronzes, etc.; $75,000. Incorporators: Leo W. Hoffman, A. B. Scolnik and Harry C. Levinson.

WINSALL CHEMICAL CO., 27 Pierce Ave., Jersey City, N. J.; organized; chemicals and chemical byproducts. Robert P. Marron, Jr., heads the company.

FRANKLIN BRASS FOUNDRY & MFG. CO., Philadelphia, Pa.; being organized to manufacture bronze, brass and other metal castings, etc., and will make application for a state charter Sept. 4. Incorporators: Martin Bain, David Rosen and Bernard H. Grossman. Representative: Herman Moskowitz, 215 South Broad St., Philadelphia.

TENNESSEE COTTON OIL CO., Wilmington, Del.; cotton oil products; $350,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

MIAMI SALT CO., Miami, Tex.; salt products; $50,000. Incorporators: R. L. Morrison and T. M. Cunningham, both of Miami.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ASPHALT, rosin and shoe wax. Warsaw, Poland. Purchase and agency.—7518.

DYES AND CHEMICALS. Bombay, India. Agency.—7493.

NAPHTHALENE, in cakes and cubes. Mexico City, Mexico. Purchase.—7495.

PHOSPHOR, chrome, aluminum, ferromangan and ferrosilicium. Warsaw, Poland. Purchase.—7504.

LINSEED OIL, tallows, oleo oils, greases and waxes. Liverpool, England. Purchase.—7489.

TANNING EXTRACTS. Liverpool, England. Purchase.—7489.

Calendar

AMERICAN BAKERS' ASSOCIATION, twenty-sixth annual convention, French Lick, Ind., Sept. 9 to 16.

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, winter meeting, Washington, D. C., Dec. 5 to 8.

AMERICAN MANAGEMENT ASSOCIATION, Hotel Astor, New York, Oct. 29-31.

AMERICAN MINING CONGRESS, Milwaukee, Wis., Sept. 24 to 27.

AMERICAN SOCIETY FOR STEEL TREATING AND INTERNATIONAL STEEL EXPOSITION, Motor Square Garden, Pittsburgh, Pa., Oct. 8 to 13.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, New York City, Dec. 3 to 6.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, annual convention, New York City, Dec. 3 to 5.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, convention and exposition, Buffalo, N. Y., Sept. 24 to 28.

INSTITUTE OF METALS, autumn meeting, Manchester, England, Sept. 10 to 13.

LAKE SUPERIOR MINING INSTITUTE, twenty-third annual meeting, Hotel Spalding, Duluth, Minn., Aug. 29 to 31.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17 to 22.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 3 to 8.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.